RAILROAD GAZETTE

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The Railroad Police.

BY JOSIAH FLYNT.

Railroad police organizations, as they have come to be understood by men who take an active interest in their management, are comparatively modern institutions. It is only during the last few years that railroaders in the United States have had any definite conception of what such organizations should be. So-called "detectives" have been employed by railroad corporations for some time, but these detached men have never formed a police organization in the sense that the term is used here. In many cases they were simply borrowed "operatives" whom detective agencies furnished the companies at an agreed upon price. Even to-day certain companies continue to look to detective agencies when they need men for police work.

In Europe, on account of the military constituting a part of the police, railroad companies have had for years what has served as a railroad police; but here again the organization meant in this article is not illustrated. Russia, for instance, built the Trans-Caspian Railway almost exclusively with the military, and, in a way, General Skobeleff, who took such an active part in subduing the Turcomans, may be looked upon as the head of the local railroad police at the time. That is to say, he saw to it that the road was started, and he superintended the protection which the road needed while in process of construction. To-day, the Trans-Caspian Railway is largely looked after by soldiers and their officers. Indeed, all of the government railroads of Russia look to the *Gendarmerie*, a branch of the military, for police work at stations. The same is true, to a certain extent, of Germany and France, although in the cities of these countries what we would call municipal policemen take the place of the Gendarmes, who operate mainly in the country districts. Thanks to laws which Continental countries have insisted upon, the police powers mentioned have generally sufficed. Among other things, walking on the railroad track in all European countries is prohibited, whereas in the United States it has long been the custom for the public to consider the track quite as much of a highway as is the turnpike. This fact alone explains not a little of the ease with which European railroad companies have been able to steer clear of many of the difficulties which have beset the American railroader. At the same time it must not be thought that European railroad conditions are ideal. During a conversation, some years ago, with Prince Chilkoff, Minister of Ways of Communication, he said to the writer that he did not consider the *Gendarmerie* system on Russian railroads an unqualified success. He even went so far as to add that he was afraid many of the *Gendarmes* were "not of much account."

In the United States the "detectives" referred to have been considered by most railroad companies to be adequate protection for their property. Only recently the writer was talking with an official of a large railroad corporation, and it was the official's opinion that the "special agents" employed were thoroughly equal to the work which they were expected to carry out. He said that the "railroad organization business," as he termed it, was wholly a matter of expense. As long as the "detectives" did the work required, it was nonsense to talk of a complex organization, which would in all probability prove very much more costly than the present regime. I suggested that the property of the corporation in question was littered up with a rabble of tramps and "hobo-thieves"; I added that such a rabble was obviously an unhealthy contingent for any railroad company to harbor. The official replied, in substance, that he was not convinced that the property was thus littered up, and even granting that it was, until it could be proved that it was cheaper to drive the rabble to cover than to allow them to travel on the freight trains, etc., there was little use in talking to any railroad company in the interests of an organized railroad police.

This has been the attitude of the American railroader toward the problems which railroad police organizations are supposed to solve, ever since the first American railroad came into existence. "Whatever you do, do as little as possible," has been the cry of the companies whenever it has come to a discussion of the police matter. Some years ago, I undertook a pilgrimage to the offices of a number of railroad presidents and general managers in the hope of interesting them in what I thought was a lucid demonstration of the value of a regular railroad police. The officials seen were very courteous and attentive, but so far as I know, their courtesy and momentary attention were all that ever came of the undertaking. On one occasion I was asked to present the matter in the form of a special report, but there is no evidence to show that the report received any very close attention.

My interest in the railroad police began about four years ago. I had just returned from Europe, when a letter came from the then General Manager of Pennsylvania Lines West of Pittsburgh, Mr. L. F. Loree, who has since become the President of the Baltimore & Ohio. It was his wish that I undertake an inspection of the tramp situation on Pennsylvania Lines West, and report to him in regard to my finding. He told me before I started out on the trip, that he had been interested in reorganizing the police service, and that he was desirous of hearing from one, who had had experience in tramp life, what the tramp profession thought of his innovations. I spent two months in studying the situation, sometimes as a *bona fide* tramp and then again as an accredited inspector; and at the end of this period I was convinced that had such a police force existed on the Northwest System while I was a tramp in regular standing, one vagabond at least would not have attempted to travel as a tramp "dead-head" from Pittsburg to Chicago over the Fort Wayne line. There was also no doubt that a great many tramps found on neighboring roads were of the same opinion. A few years before this trip I had traveled over the Fort Wayne with impunity as a tramp, and had found the property littered up with vagabonds and tramp camps of all kinds and descriptions. The camps had utterly disappeared, and only a handful of train-riders were encountered during the 30 days that I associated among them.

Charges Under Which Arrests Were Made.

	Train riding.	Trespass (Ohio, 1894).	Gate ordinance (Cleveland, 1896).	Robbery.	Petit larceny.	Intoxication.	Disorderly conduct.	Vagrancy.	Destroying property.	Stoning trains.	Miscellaneous.	Total.
1894....	117	1	..	6	14	..	1	..	6	..	..	143
1895....	687	13	..	6	26	11	21	22	10	9	15	800
1896....	2,066	43	14	18	132	43	29	23	5	11	11	2,395
1897....	4,531	119	11	19	220	119	209	186	31	16	52	5,513
Total...	7,401	176	25	45	392	173	260	211	52	36	80	8,851

Miscellaneous includes: Train wrecking, 4; pocket-picking, 8; obstructing track, 1; receiving stolen goods, 7; assault on employees, 14; assault on passenger, 1; assault and battery, 10; shooting, intent to kill, 1; murder, 2; lunacy, 4; indecent exposure, 3; confidence men, 4.

1894—One division organized six months.
1895—One division organized one year.
1896—Three divisions organized one year partially.
1897—Five divisions organized one year partially.

DISPOSITION OF PERSONS ARRESTED.

	Nollied.	Discharged.	Fined.	Reform school.	Workhouse.	County jail.	Penitentiary.	Escaped.	Hospital.	Asylum.	Disposition not known.	Total arrests.	Amount of fines paid.
1894.....	6	10	125	1	...	...	..	1	..	..	...	143	$557.35
1895.....	17	119	271	..	62	144	4	..	2	1	180	800	1,892.05
1896.....	19	597	744	..	399	580	13	..	4	1	38	2,385	3,858.80
1897.....	16	1,807	2,068	..	786	791	26	..	2	4	13	5,513	7,600.56
Total.....	58	2,533	3,208	1	1,247	1,515	43	1	8	6	231	8,851	$13,908.76

On my return to Pittsburg it was made possible for me to study the new organization in its official aspects, and these are some of the facts which were brought to light.

The force on the Northwest System—and it must be remembered that this part of the general property takes in such cities as Pittsburg, Cleveland, Chicago and Toledo, where there is always a riff-raff population in the shape of coal-pilferers and local train-riders—was made up of 83 officers and men. The chief of the force was the inspector, whose jurisdiction extended to the Southwest System also. He reported to the general manager, and was almost daily in conference with him. For a representative to manage things when he was out on the road, and to relieve him of road duty when he was needed at headquarters, he had an assistant inspector, a man who had come up from the ranks, and had demonstrated that he had ability for the position. Each division of the road had a captain who reported to the division superintendent as well as to the chief of the force. This captain had under him one or more lieutenants and the requisite number of patrolmen and watchmen, who reported to him alone. An order from the general manager consequently reached the men for whom it was intended through official channels entirely within the service; the same was true of statements and reports of the men to the general manager. Day in and day out, every man in the service knew what he had to do, and expected to be called very promptly to order if his work failed to come up to the required grade. I found that hunting down trespassers and thieves was only a part of the routine. The property was patrolled almost exactly as is a large city, and the men were expected to make reports about such matters as the condition of frogs and switches, switch lights, fences and station buildings, to do preliminary work for the claim department, to protect the pay car, to look out for excursion trains, and generally to make themselves useful. They were all picked men, and were expected to come up to the requirements of the United States Army as regards physical health and strength. Their personal records were known for five years previous to being employed on the force.

They constituted for the general manager an invaluable guardianship. He had but to press the button, so to speak, and within a few hours the entire force was at work carrying out his orders. Through the service he could keep in touch with a thousand and one matters which would otherwise have escaped his notice, and he could order an investigation with the assurance that he would receive an exact and trustworthy report within a reasonable amount of time.

Such was the organization. Its performance up to the date of my investigation had consisted in cleaning up a property that had once been overrun with tramps and the like. At the time in question the property had become known as one of the tightest shut roads in the country from the trespasser's point of view, and the company had been saved $17,000 a year in the expense account for its police service, although this service had been made to assume duties that the old service of "detectives" and watchmen had never undertaken.

The following statistics illustrate the effectiveness of the police force during the first four years of its existence. Since 1897, the number of arrests has decreased with proportionate rapidity.

Some time after the investigation for Mr. Loree, it was my good fortune to be able to become still more intimately acquainted with the new police service as a regular patrolman. I asked for this privilege in order that I might see from the inside, as it were, whether the favorable impression due to the original inspection would be repeated. My duties as a patrolman extended over about two months, during which time it was permitted me to watch the workings of the improvements from the inspector's office down to the patrolman's "beat" on the track, or at the station. I can only say that the experience confirmed the original favorable impression. To be sure, there were things which one interested in a perfected railroad police service, might want slightly changed; but the general effect of the experience convinced me that the experiment was a success, and I was in a position to judge from the view-point of a man who had for years been mixed up with men whose business it is not only to steal rides, but also to rob freight cars.

During Mr. Loree's presidency of the Baltimore & Ohio, a similar police service has been introduced on that property, under the superintendency of Mr. C. E. Burr, the gentleman who assisted Mr. Loree while he was general manager of Pennsylvania Lines West. As in the case of Pennsylvania Lines West, one division at a time has been organized, and there has been no attempt to unduly force the change over the old order of things. So far there is every reason to believe that good will come from the innovations introduced.

So much for the history of what is to-day recognized among professional railroad police specialists as the latest movement in the direction of definite organization. The majority of the railroad corporations still cling tenaciously to the old order of "detectives" and uncontrolled watchmen. The criticisms to be made of this antiquated and un-businesslike method are too numerous to be noticed in full in this one article, but it is appropriate to point out some of its most glaring faults.

Let us consider first the question of expense. This was the point brought up by the official of the "large corporation" mentioned in the early part of my article, and critics of the new railroad police are continually refer-

ring to it. When the question of a new police service was first discussed on the Pennsylvania Lines West, it was found that the service in operation at the time consisted of over a hundred detectives and watchmen with no other government over them than that of the division superintendents, trainmasters and station agents. They wandered over the property with very little method, and they paid practically no serious attention to the train-riders. Many of them were old men wholly unfit for any kind of police work. When the weeding out process began, three old men were discovered "watching" an abandoned engine house, their services costing the company $40 apiece a month. Other more or less similarly ridiculous expense items were unearthed, some superintendents not even knowing how many watchmen they carried on their pay-rolls. As has been stated, the new force, when completed, consisted of but 80 odd men, and they cost the company $17,000 a year less than had the discarded service.

It is my firm belief that if other large railroad properties were carefully examined pretty much the same state of affairs would be found as that encountered by Mr. Loree on the Pennsylvania Lines West, when he undertook to overhaul the police service. I am morally certain, for instance, that there are men posing as "detectives" and watchmen on the pay-rolls of many a division superintendent, who never do an honest day's work. Why are they carried on the pay-rolls? Sometimes because they are favorites of the superintendent, sometimes because they have been so long with the company that the latter does not know what else to do with them—many a railroad official looks so slightly on the importance of a railroad police service, that he considers it a suitable asylum for broken-down trainmen, etc.—and then again because the company will not take the time to seek out more efficient men to take their places. Yet these same companies complain about the expense which a reorganization of their police forces would involve. The fact is that all of the large corporations would *save* money by reorganization, and that many of the smaller roads would at least get a better service for the same amount of money now expended.

The efficiency of the "detectives" is the worst fault of the system for which they stand. Take almost any of the trunk lines between New York and Chicago. They are all high-roads for tramps. The "detectives" make spasmodic efforts to arrest a few of them, but there is no such persistent fight against them as proved successful on the Pennsylvania Lines West, and is going to prove successful on the Baltimore & Ohio. Some railroad officials are inclined to think that the train-riders do not constitute a serious problem. They are not only a serious problem from the view-point of the state, but they are a demoralizing factor in the life of the railroads themselves. The employees are constantly coming in contact with them, and are continually listening to their mouthy attacks on capital and corporations. It is no exaggeration to say that many a young railroader has got his first lesson in socialism, as the tramp understands it, from the trespassers and train-riders with whom the company allowed him to associate, while performing his duties as an employee. The railroad is the main citizen of the State from the taxpayer's point of view. The State has a right to demand from the railroad that it at least refuse to harbor men and boys who make the railroad track practically as bad a slum as will be found in any city. The "detective" system has so far signally failed to satisfy this just demand of the State.

The very term "detective" is a mistake. It hurts the railroad with the public, and it is really a misnomer. I have seen very few men who called themselves railroad "detectives," who deserved the name. A genuine detective, a real detector of crime, is a rare article; arresting tramps, and running over the property with a document dealing with a claim against the company does not constitute a "sleuth." On the two railroad properties where the new police service has been introduced, the men receive titles very similar to those given to municipal policemen. On the Baltimore & Ohio the titles are as follows: Superintendent, Inspectors, Captains, Lieutenants and Patrolmen. There are no "detectives" in the service. There are men who are capable of close investigations, but they are not supposed to call themselves "sleuths."

Finally, the railroad "detective," as he is now constituted, is more apt to pay attention to crimes with rewards attached to them than to those which merely involve fulfilment of duty. He is also very prone to take "tips" from municipal policemen in regard to such rewards. Many a time when he should be working for the company, he is following up some such "tip," although it may have nothing to do with the company's business.

If all the railroads would take concerted action in regard to the new methods in the railroad police business, in a few years the following very satisfactory results would be achieved: First, very few tramps, if any, would try to beat their way on trains. An appreciable number of tramps would also give up tramping entirely, because to many of them their present railroad privileges constitute the main attraction of the life. A few might attempt to do "criminal work" by way of revenge and because the turnpike presented too few privileges, but these would soon be brought to book.

Second, much less property would disappear from freight cars. A tramp said to me not long ago, that every twentieth train on one of the main trunk lines is "dug into" before it has got 40 miles out of Buffalo. A well-organized police service would stop this kind of robbery in short order.

Third, the claims for damages would very materially decrease. A number of persons, who are not tramps, trespass on railroad property to-day. Some are farmers desirous of saving a few cents during a ride on a freight train, others are bicycle riders who think that the path beside the track is a public thoroughfare—these trespassers even make use of the station platforms for riding purposes—still others are young boys, who "hop" both passenger and freight trains for a short distance. When one of them comes to grief, and a hungry lawyer is engaged to "squeeze" the corporation, the corporation very frequently gets "squeezed."

Fourth, a better morale would be observed among the employees. It was the custom on the Pennsylvania Lines, when the new police service was started, for the employees to look upon the innovation as a spying concern. I can state from personal observation that there are a great many employees on those lines to-day who are thankful for the change, although they themselves may often be reported by the policemen. The new service is anything but a spying concern. It is a police service as above-board as is the running of the trains. As long as the employees attend to their duties no patrolman would dare to make a false report against them.

For the benefit of railroad police organizations which may be organized in the future, the following suggestions may not be amiss.

The superintending officers of the force should be superior men. In the average municipal police organization the chief, inspectors and captains come from practically the same stratum of society which supplies the patrolmen, and the latter have but little to look up to in their commanders but an accidental authority, such as they may themselves enjoy if they live long enough. Merit is deserving of reward no matter where found, but it is not necessary that the reward should call for the promotion of a patrolman to a chief's position merely because he has managed to do well that which he was told to do. In Germany a police patrolman has not the slightest hope of becoming so much as a lieutenant until he has passed a severe examination which implies a college education; he consequently realizes that his superior officer is entitled to his position on other grounds than those of mere "pull" or "seniority." A similar dignity should be attached to the authoritative positions in the American railroad police.

The superintendent of the service should be as supreme in it as is the superintendent of a division in his bailiwick. This point is brought up because on most railroads in this country the police arrangements are at present such that almost every man with the slightest official power considers it his right to give orders to the "detectives." Whether an American railroad police can be organized on as broad lines as in Germany, for instance, where practically all the railroad officials have police power, is a question which it is not necessary to attempt to decide here; but it can be safely stated that, before an American railroad police service can become effective, some man must stand at the head of it in no unmistakable manner.

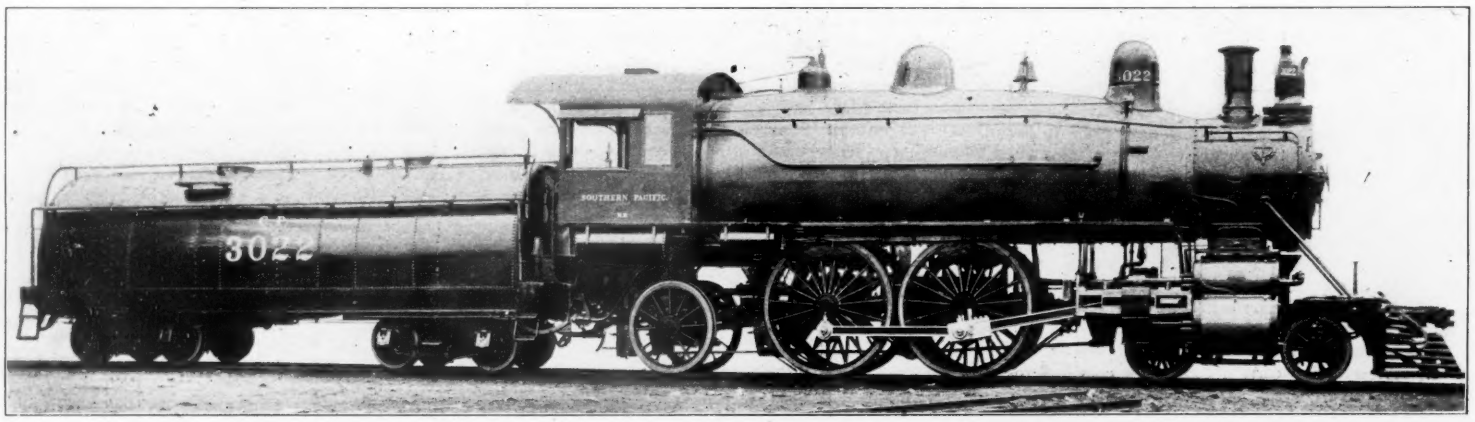
On the Pennsylvania Lines, and lately on the Baltimore & Ohio also, the superintendent of the police service has been given jurisdiction over the track-walkers, crossing switchmen and gate-keepers. This is a branching out which so far has been productive of good results, but it might easily prove possible that such duties would prove too burdensome.

In conclusion, it may be said that reorganization of the present chaotic railroad police conditions stands for system, order and faithful service. On the lines where the reorganization is an accomplished fact, the properties have been relieved of a miscellaneous collection of vagabonds, and the companies have been saved money, not only on the pay-rolls, but in the department of claims as well. Furthermore the reorganized police forces have contributed to the well-being of the communities in which they operate by supplementing the work of the municipal police and the rural constabulary. In other words, they have tried to fulfil their mission as representatives of the most prominent citizens of the States in which they are active.

Oil Burning Atlantic (4-4-2) Type Locomotive for the Southern Pacific.

The Baldwin Locomotive Works has completed a number of Atlantic (4-4-2) type locomotives for the Southern Pacific, equipped with the Vanderbilt boiler and arranged for burning oil. The tender is the semi-circular construction designed by the Southern Pacific for use on their oil burning engines, and was described at length in the *Railroad Gazette*, Oct. 3, 1902. This is the first locomotive of the Atlantic type built by the Baldwin Works with the main rod connected to the front pair of driving wheels.

The cylinders are Vauclain compound and are 15 in. and 25 in. x 28 in., and the drivers are 79 in. in diameter.



Oil Burning Atlantic (4-4-2) Type Locomotive for the Southern Pacific.
(Built by the Baldwin Locomotive Works.)

The total weight of the engine in working order is 200,000 lbs., with 102,190 lbs. on the drivers. The total heating surface is 3,038 sq. ft., and 155 sq. ft. is in the fire-box. The boiler is 66 in. in diameter and is designed for a working pressure of 200 lbs. The boiler contains 346—2 in. tubes 16 ft. long. The tender weighs 140,000 lbs., and has a capacity of 7,300 gal. of water and 3,300 gal. of oil.

Superheated Steam in Locomotive Service.

II.

Development of Practice—The Schmidt System.

As long ago as the early sixties, superheaters were in use upon certain steamers operating on the Atlantic coast. These were generally so arranged that the steam in passing from the boiler to the engine might be passed through the coils of the superheater or around them, or the engine could be supplied with a mixture of saturated and superheated steam. It is probable that in the latter case, the superheater merely becomes a means for pretty thoroughly drying the steam supplied the engine. The value of such an arrangement was not at all questioned by those concerned with their operation, and elaborate tests by Isherwood served to confirm the popular impression. But notwithstanding the advantage derived from their use, the superheaters were difficult to maintain, even though the steam pressures were but 40 lbs., and the trouble arising from them gradually led to their abandonment upon the steamers referred to.

In 1877 a series of elaborate tests were conducted by Mr. George B. Dixwell upon a small Harris-Corliss engine when supplied with saturated and with superheated steam. These, while confirming previous conclusions as to the advantage of superheated steam, did not serve to enlarge American practice in connection therewith. In recent years, while superheaters have occasionally been used in various classes of service, they have gained no footing in our practice, and gradually American engineers have come to believe that while a superheater will unquestionably improve the thermal action of an engine, the cost of its maintenance quite offsets the advantage to be derived from its use. If, it is argued, the maintenance of the superheater gave trouble when the steam pressure was only 40

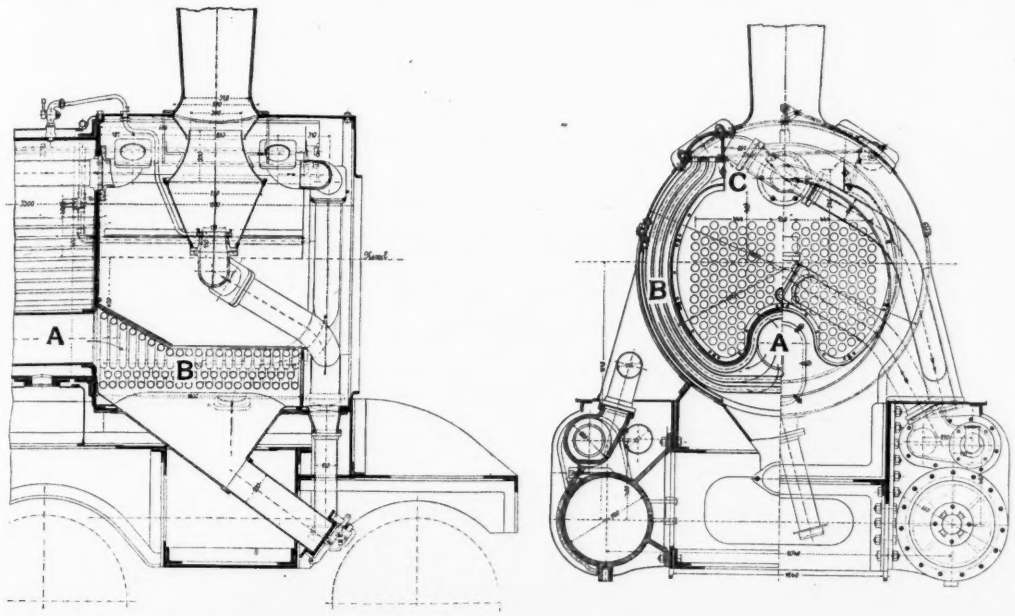
lbs. and the temperature of the superheated steam was only about 400 degrees F., how much more difficult is the problem to-day when the temperature of saturated steam approaches 400 degrees and the temperature of the superheated steam to be effective must be not less than 600 degrees F. This view is well represented by Professor Peabody in the last edition of his "Thermodynamics," which is as follows:

> "Whenever superheated steam has been used so as to give a notable gain in economy the superheating has been accomplished in a separate apparatus, which has taken the form of a coil of pipe exposed to the products of combustion beyond the boiler. Now it is the accepted experience of boiler-makers that surfaces exposed to the fire must be of moderate thickness or they will rapidly waste away. Thus, it is not desirable to make furnace-flues more than half an inch thick, and if they are made thicker they are liable to waste away till they are reduced to about that thickness. Plates and tubes if thin enough endure long service in a boiler when exposed to the fire because they are kept at a moderate temperature by the water in the boiler. If steam is to be superheated strongly in a coil of pipe or other device which is exposed to hot gases, the metal of the superheater must be strongly heated and is sure to waste away rapidly. There is no material that can stand long service when exposed at once to a high pressure and a high temperature. There is little risk, therefore, in predicting that all superheating devices now used will eventually be discarded for this reason."

While it is true that occasionally during the past twenty years, superheating has been resorted to in connection with plants of unusual significance, and while it is also true that some activity in the employment of superheated steam has manifested itself during the past year, enough has been said to show that American engineers threshed the straw of superheating many years ago, and have since been content to let the matter rest undisturbed.

Abroad, and especially in Germany, for ten years past there has been a great awakening of interest in superheated steam. The technical schools of Germany, for example, all have large superheaters in connection with their experimental engine plants, and in their practice, as well as in their more scientific work, the Germans are devoting themselves to the problem of superheating. Among those who have had a conspicuous part in this movement, perhaps none have been more energetic or successful than Herr Wilhelm Schmidt. Some ten years ago, Herr Schmidt began the introduction of stationary boilers and engines designed for the generation and use of superheated steam. The Schmidt system as applied to stationary plants involves special construction both in boiler and engine, and tests of several different plants have shown a consumption of less than 1.7 lbs. of coal per horse power hour, while in the case of a single test which has come under the writer's observation, the consumption has been reduced to 1.02 lbs. per hour. This is a record of high performance. The engine employed in the Schmidt system is peculiar chiefly in the design and arrangement of its valves which are of the piston type and with which the present discussion is not especially concerned. The boiler has a vertical shell within which is arranged a large corrugated fire-box and combustion chamber, extending approximately two-thirds the height of the shell. The grate has a smaller area than the cross-section of the fire-box, the difference being effected by a few courses of fire-brick which make up a cylindrical lining for a short distance above the grate. Higher up, the combustion chamber is crossed by circulating tubes of considerable diameter, the surface of which, together with that of the corrugated tube making up the fire-box and combustion chamber, constitutes the direct heating surface. From the top of the combustion chamber, a single flue of considerable diameter opens out through the upper head of the boiler. This flue receives the products of combustion from the fire-box and delivers them to a superheater arranged above the boiler. The superheater consists of pipe 2.4 in. in diameter arranged in a series of flat coils one above the other, there being as many as twelve such coils, while above these superheating coils are other coils forming a feed-water heater.

The action of such a device is apparent. The comparatively small amount of heating surface and the short and direct passage between the furnace and superheater serve to supply the latter with gases at a high temperature, while the extent of superheating surface and the presence of the feed-water heater beyond serve to reduce their temperature to satisfactory limits before they are allowed to escape into the chimney. Encouraged doubtless by his success in stationary practice, Herr Schmidt has extended the application of his system to locomotives,



The Superheater of the Schmidt Locomotive.
Reproduced from the Railroad Gazette, Oct. 10, 1902.

with the result that there are now four or five locomotives of the Schmidt type running and still others building. These engines are in service on the State Railroads of Prussia, and it is claimed that their performance is 25 per cent. better than that of similar engines using saturated steam.

The application of the Schmidt system to the conditions of locomotive service has already been described and elaborately illustrated in these columns and the figures which are herewith given have been selected from previous articles.* The Schmidt system involves no material changes in the exterior form of the locomotive boiler, but the tubing is modified and the smoke-box design is so changed as to accommodate the superheater which is located therein. Two views of the front-end with the superheater are shown by Fig. 1. In Herr Schmidt's latest construction, a flue (A) 10 or 12 in. in diameter extends from fire-box to smoke-box along the lower portion of the barrel of the boiler. This displaces from 20 to 30 of the small tubes which otherwise would have its place. Its purpose is to deliver to the smoke-box a considerable volume of furnace gases at a high temperature, in the accomplishment of which purpose the tube serves well. To give room for the superheater, the diameter of the smoke-box shell is somewhat greater than the barrel of the boiler. The pipes of the superheater occupy a space (B) lying between the outside shell of the smoke-box and an interior partition sheet, a cross-section of this space having the shape of a horse-shoe, the toe calk of which may be assumed to be at the bottom of the boiler. The construction is such that the gases discharged from the small tubes are free to pass directly up the stack, having thus no contact with the superheater, all as in an engine of usual construction. The gases discharged from the large flue, however, pass into the space B occupied by the superheater at a point near the bottom, and sweeps around on either side, and are discharged into the smoke-box space on either side at points near the base of the stack. The length of this annular space in the direction of the axis of the boiler is almost equal to the diameter of the boiler. It is filled with the pipes of the superheater. The pipes start from a header near the stack on one side, and pass around to a similar header near the other side, the extent of the superheating surface thus provided equaling 25 per cent. of the direct heating surface of the boiler. The headers are so arranged that steam passing the throttle of the engine goes to one of the headers, thence by one-half of the whole number of pipes to the opposite header, thence by the remaining pipes back to the first header, from which it is conveyed to the cylinders. In its passage and re-passage of the pipes, the temperature of the steam is raised to 500 deg. and 600 deg. F., which is from 125 deg. to 225 deg. above the temperature of the saturated steam at usual boiler pressures.

The engines of the Schmidt superheating locomotive involve special designing with respect to valve, the principal characteristic of which is to be found in its piston valve. It is probable that any of the well designed balanced valves now used in this country can be successfully employed in distributing the steam delivered by a Schmidt locomotive boiler and superheater. For this reason further attention will not be given the details of the Schmidt engine construction, but those who care to follow the matter further will find a good description of all portions of the mechanism in the article to which reference has already been made.

(To be concluded.)

*Railroad Gazette, Oct. 10, 1902, pp. 775-777.

Gillmor's Automatic Switch Lock.

At first the introduction of automatic signals gave rise to an increased number of hand switches and the abandonment of distant switch signals. Now, even with automatic signal protection, the retention of hand switches is being generally discouraged and some superintendents are insisting on protecting such as are retained by distant switch signals of distinct pattern in addition to automatic signals. It would seem therefore that automatic signal protection for switches is not all that is desired.

Like the poor, the hand switch will always be with us. As automatic signal service enlarges and improves the trainmen grow lax in taking the old measures of protection. As hand switches decrease, the more like automatons do the trainmen become. Hence the urgent need of fully protecting such switches, the trailing no less than the facing. More wrecks at trailing switches than at facing points have come to the writer's notice and this should not be unexpected when one considers that trailing switches are not generally so well protected and, not being considered as dangerous, are handled less cautiously.

In spite of discipline, indicators and time locks trainmen will occasionally open a switch after an approaching train has passed all signals controlled by the switch. To have

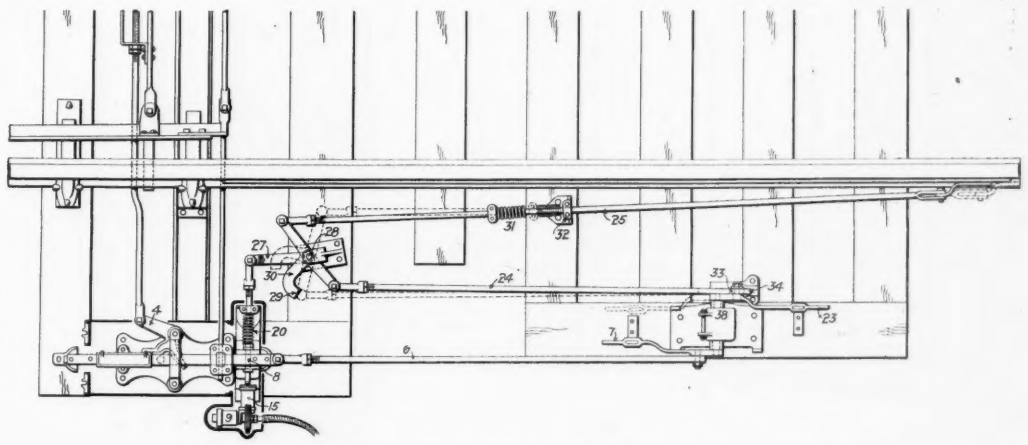


Fig. 1.—Gillmor's Automatic Switch Lock.

the approaching train automatically lock the switch normal and keep it so locked until the train has passed out of the block is an old idea. But, in addition to this, to give to this train only, and to it only when at the switch, a means of unlocking the switch is the function of this lock.

When a switch equipped with such a lock is pipe-connected with its derail no movement can be made out in the face of an approaching train, for the switch cannot be "reversed" after a train has entered the controlling block. In other words, a movement cannot be made from any track to one which is automatically signaled unless the controlling block is unoccupied and the controlling signals first put to danger.

Should an approaching train which has locked the switch desire to unlock it in order to use it the trainman

uses what may be called the "unlocking lever," which lifts a detector bar above the rail. This bar when forced down by the wheels of the train unlocks the switch. The bar being once depressed it is automatically clutched in that position and will so remain, keeping the switch unlocked as long as the unlocking lever remains in the reversed position. This lever in the reversed position keeps the controlling signals at "danger" regardless of the position of the switch.

The application of the locks to a crossover between two tracks, both of which are protected by automatic signals, will be readily understood when it is remembered that the two ends of the cross over are pipe connected and operated by the one lever, and that each end is equipped with an automatic lock and unlocking arrangement controlling and controlled by the signals of their respective tracks. Hence a train on one track is in position to unlock the switch on that track but still cannot reverse the crossover unless the other end, on the other track is unlocked; that is, not unless the controlling block on the other track is unoccupied.

The construction and operation of this lock may be understood from an examination of Fig. 1, showing the arrangement used with electro pneumatic signals on the Pennsylvania Railroad. The switch is operated in the usual manner through the switch rod, the crank (4), the longitudinal rod (6), and the hand lever (7). Rod 6 is locked by the transverse bar at 8 when it is in closed position, and rod 8 is moved by the piston of pneumatic cylinder 15. The admission of air to this cylinder is controlled by an electro-magnet (9), the circuit of which extends by line wires to the distant signal regulating the approach to the home signal which guards the entrance to the block section in which the switch is situated. Normally, 8 is unlocked, but when a train passes the distant signal the lock circuit is broken, 9 is demagnetized, the air pressure is discharged and bar 6 is locked by the pressure of spring 20.

The switch cannot then be unlocked except by the train going out of the block section, which closes magnet 9 and fills cylinder 15 with compressed air, or by the action of the switchman (or trainman) who intends to use the switch.

After the switch is thus locked by the approach of a train, if it is desired to set it for the side-track, lever 23 is pulled over, and, through 24 and 25, the detector bar is raised. This being raised, the engine which is to be moved into the side-track is run forward until it stands on the detector bar, pressing it down. This pressure unlocks the switch against the pressure of spring 20. The locking bar at 8 is moved by the pressure of the bent arm 29 against lever 27, and spring 31, when the engine has depressed the detector bar. There is a slot 33 at the end of rod 24 to permit the necessary unlocking movement, and an extension on the rod engages with a shoulder 34, which is snapped into place by means of a spring. This holds the detector bar down and keeps the switch unlocked until lever 23 is again thrown over to the left after the switching has been done. In throwing over 23 the catch at 34 is released. Lever 7 has a circuit breaker 38 connected with the rail circuit so that if the brakeman should carelessly go off and leave the switch lock fastened in the unlocked position the signal at the entrance of the section could not be cleared, circuit breaker 38 holding this circuit open.

If a train is not going to do any switching the movement of the unlocking levers is unnecessary except the one required to unlock the switch. It has seemed advisable, however, to give one set of directions to cover all conditions, even though at times it requires more lever movements than necessary. The trainmen accustomed to the work soon learn to omit the unnecessary lever moves. The only feature in which the operation is slower than it would be with the same switches suitably equipped with distant switch signals is in the time required to place car wheels on the detector bar. After the switch is once unlocked it is just as free and quick as any hand switch.

That the trainmen can be depended upon to properly operate the device is no longer a question. The worst that can happen is delay.

As to cost of installation: Assuming that the switches ought in any case to be pipe-connected there is the cost of the automatic lock, the controlling electrical wire and the battery, as against mechanical facing-point-lock controlling devices, the wire run, and the distant switch signal.

From a maintenance standpoint the comparison is even more favorable. The installation and maintenance of the electrically controlled lock should be somewhat less than electro-pneumatically controlled.

Where these locks have been put in service it has been customary in addition to regularly printed notices to trainmen to print instructions on a piece of sheet iron about 8 in. x 14 in., and tack the same to the switch movement covers on the ground, and also letter the operating levers as shown in the sketch.

Fig. 2.

[Printed Instructions on side of Lock Box.]

FOR TRAINS ON SIDING DESIRING TO USE THIS SWITCH.

1. Reverse switch lever.
2. Reverse unlocking lever and leave reversed until through using switch (only necessary in case of wishing to shift).

FOR TRAINS ON MAIN TRACK DESIRING TO USE THIS SWITCH.

1. Reverse unlocking lever and leave reversed until through using switch.
2. Put train wheels on detector bar.
3. Reverse switch lever.

Bridges on the Eastern Illinois & St. Louis.

In the *Railroad Gazette*, March 13, there was a description of the new Chicago-St. Louis line which is being built by the St. Louis & San Francisco to connect the Chicago & Eastern Illinois with St. Louis, under the name of the Eastern Illinois & St. Louis. The article also gave the principal features of the specifications for the steel bridges on this line. We now show a general plan of the 550-ft. double-track steel trestle over the Middle Fork of the Big Vermillion River and the Illinois Central Railroad. The trestle referred to consists of five 60-ft. spans, one 65-ft., and five 30-ft. tower spans. As shown in the illustrations (Figs. 1 and 2) the girders of these spans have a depth of 6 ft. back to back of flange angles. Stiff angle bracings will be used for these

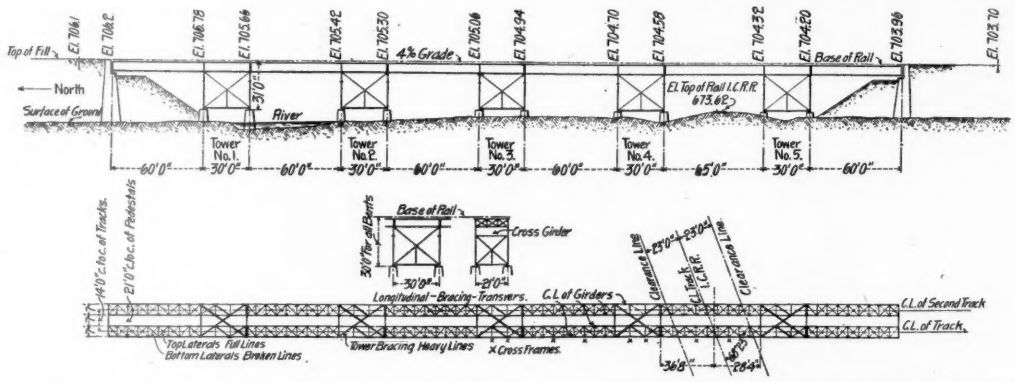


Fig. 1.—Plan and Profile of 515 ft. Double Track Trestle over Middle Fork of Big Vermillion River and I. C. R. R. for Eastern Illinois & St. Louis R. R. Designed by T. L. Condron, Consulting Engineer, Chicago.

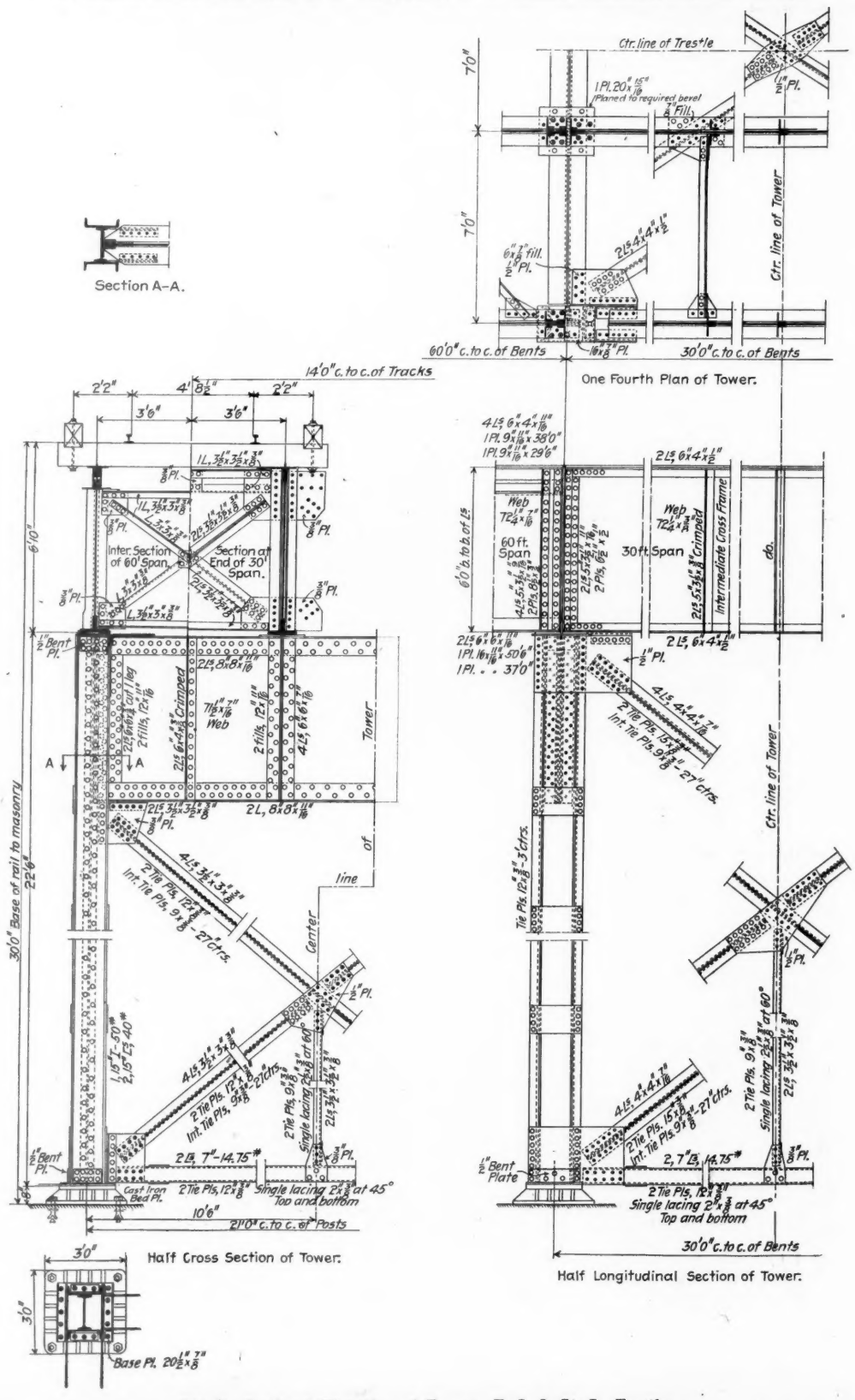

Section A-A.
Ctr. line of Trestle
Ctr. line of Tower
60'0" c. to c. of Bents
30'0" c. to c. of Bents
14'0" c. to c. of Tracks
One Fourth Plan of Tower.
Inter. Section of 60' Span.
Section at End of 30' Span.
Tower
Center line of
Half Cross Section of Tower.
Half Longitudinal Section of Tower.
Base Pl. 20½"x7/8"

Fig 2.—Sectional Elevation of Towers, E. I. & St. L. Trestle.

spans as well as for the towers. A general description of this structure was given in the previous article.

Where the new line crosses the Lake Erie & Western there will be a 54-ft. double-track through plate-girder skew span with a shallow floor, the general features of which are shown in Fig. 3. As will be seen, the center girder for this skew span is made the same length as the two outside girders. The small girders extend from the ends of the main center girder to independent bearings on the masonry which support the inner ends of the end floor beams. By this arrangement considerable metal has been saved from what would have been required if the center girder had been made the full length necessary to receive the end floor beams.

As but one side of this bridge is to be built this season, it has been so designed that the floor beam connections for the two sides do not come together, but are offset enough to make it easy to put in the floor for the second track without disturbing any of the connections of the floor for the first track. The masonry plan for this skew plan is shown in Fig. 4. These abutments are to be built of gravel concrete. The details of a design of steel-concrete cattle pass to be used on this line are shown in Fig. 5. Corrugated steel bars, furnished by the St. Louis Expanded Metal Fireproofing Company, are used for reinforcing the structure, which has been calculated for the same loading as the steel bridges on the line. It is designed to be equally as strong as an I-beam span of the same length and has the added advantage of giving a solid ballasted track over the opening.

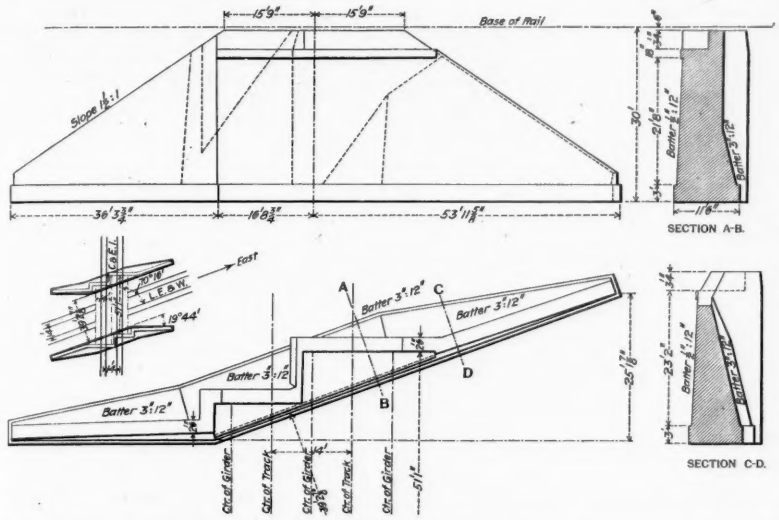


Fig. 4.—Masonry Plan for Double Track Through Plate Girder Span over L. E. & W. and E. I. & St. L. Railroads.

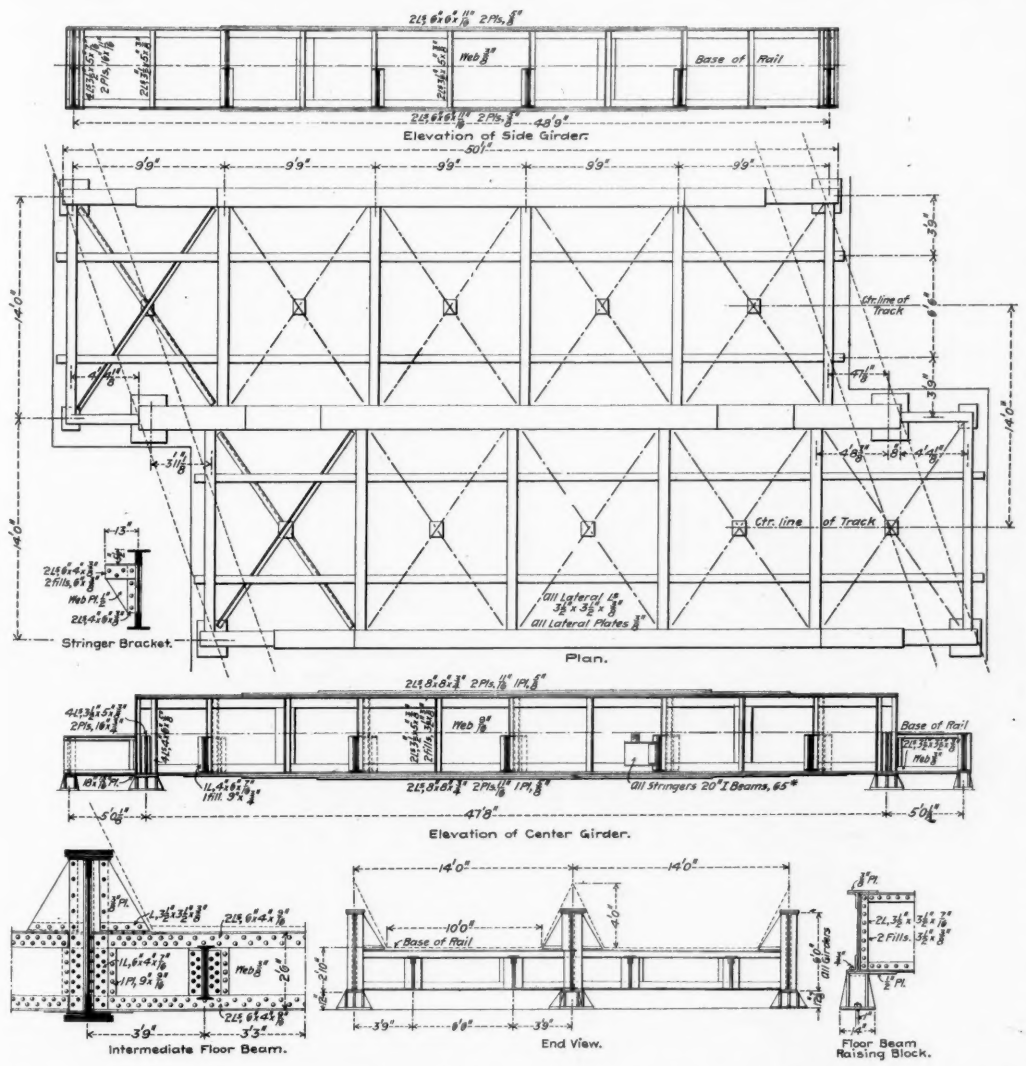


Fig. 3.—General Plan of Double Track Through Plate Girder Span over L. E. & W. and E. I. & St. L. Railroads.

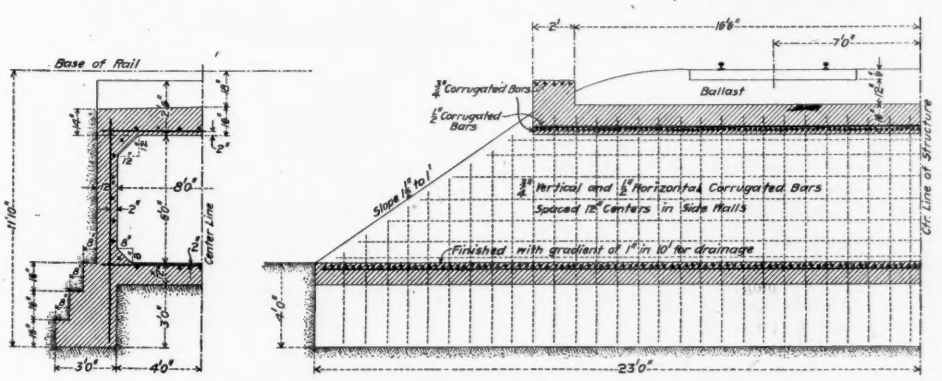


Fig. 5.—Steel-Concrete Cattle Pass for E. I. & St. L. R. R.

The quantity of bars required for this structure is approximately 10,000 lbs.

The bridges have all been designed under the direction of Mr. W. S. Dawley, Chief Engineer, by Mr. T. L. Condron, M. Am. Soc. C. E., Consulting Engineer, and are being built by the American Bridge Company at its Detroit plant.

The Training of the Civil Engineer.*

Broadly speaking, as distinguished from mechanical engineering, it may be said that civil engineering deals with structures, or works at rest; while mechanical engineering deals with machines and motors, or works which are in motion. It will be seen, however, that the execution of civil engineering works requires at many points the collaboration of the mechanical or the electrical engineer, and that it also brings the practitioner into close contact with economic and sociological problems.

What, then, are the qualities which fit a man for success in this great profession? In the first place, it is evident that the ideal civil engineer must be a scientific man and at the same time a business man. He must have a thorough knowledge of the laws of nature, the fundamental principles of mathematics and the materials of construction, for his work consists in applying these laws, principles and materials so as to make them of use in the world's business. He should be essentially a man of action, not a bookworm. His work is not so much the discovery of laws of nature as their application and utilization, although he may incidentally or accidentally be a discoverer also. The pure scientist in his laboratory or the bookworm among his dusty tomes may discover laws and yet not claim or deserve the title of engineer. The engineer is he who makes them available for the use and convenience of man. His dominant quality must be practical common sense, combined with habits of care and accuracy, and with the courage and training which will enable him to solve new problems and to meet emergencies. He must appreciate, professionally as well as morally, the advice of Emerson, "Always do what you are afraid to do," provided he knows that he is right; but he must further appreciate the injunction, "Be bold, be bold; be not too bold." His mistakes may be very costly and his opportunities for effecting economies by skilful design and construction very great.

It must not be assumed that in order to be a successful engineer a man must be a fine mathematician. I should rather be inclined to say that in order to be a good engineer he must not be what would usually be called a fine mathematician, or at least that he must in addition possess other mental qualifications which are of far greater consequence; for mathematics is in its essential conceptions and methods an abstract science, and the great mathematician is apt to lack the qualities of action, the quick decision, the accurate judgment, the ingenuity in meeting and overcoming obstacles and the natural grasp and insight leading him to see the physical possibilities of a situation which must distinguish the successful engineer. On the other hand, the engineer should have a liking for mathematics, and a quick and instinctive grasp of its principles and methods, together with the insight which will enable him to see how they are to be made use of, and to use them properly when the time comes.

It is unnecessary to enlarge upon the general qualities of character, personal appearance, etc., which a man in any walk of life should endeavor to possess, and which are not peculiar requirements of the engineer. But it may be remarked that the training of the engineer is likely to emphasize for him one essential qualification, honesty. The student of nature is trained to seek only the truth. He is not concerned with endeavors to make the worse appear the better reason; but his only aim is to arrive at the truth concerning the eternal principles which govern the world around us, and to make them subservient to the interests of man. A lawyer is said to have remarked, "We don't want especially to get at the truth; we want to try cases." This does not imply a lack of honesty, but illustrates the lawyer's point of view, which is to make his case appear as strong as possible, leaving somebody else to decide what is right. This natural bias in the direction of truth is, perhaps, one reason why engineers are being sought after more and more to fill administrative positions requiring a judicial temperament. Indeed, taken as a whole, I believe there is no profession which can be more depended upon for absolute integrity and unswerving honesty. On the other hand, the work of the engineer is often of a character which does not produce polished manners or a good address, the lack of which qualities is sometimes a bar to the highest success.

How shall a young man best prepare himself for this profession? Since it is a business as well as a science, some of its members have entered it from the business end and some from the scientific end; that is to say, some have begun in an engineering office, gaining experience and studying at the same time, while others have begun by getting a thorough technical training in an engineering school. Some of the best engineers in the profession have pursued the former course, and in England it has been the usual custom for a young man to become articled as a student to some practising engineer, paying a round sum for several years for the opportunity, instead of re-

*Extracts from an article by Prof. George F. Swain, in the *N. Y. Tribune*.

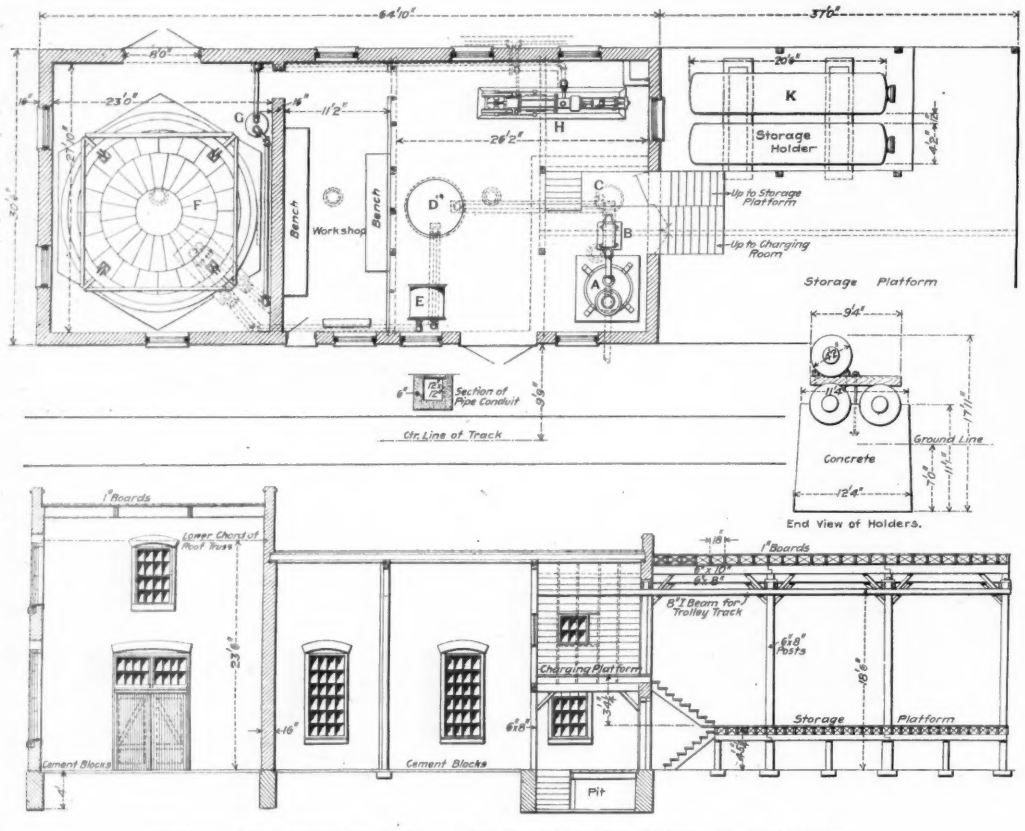
ceiving any compensation for his services. But at the present time it may be stated unhesitatingly that the only proper and safe way to become an engineer is to obtain a thorough training in one of our engineering schools. There are many things that the great majority of men will never learn unless they learn them in a professional school; and nowhere else can a man gain so well or so quickly the breadth of view and the adaptability which will enable him to meet new problems. Moreover, the young man who aims to become an engineer should secure a broad training, not devoted entirely to technical subjects, but covering those subjects of a general nature which are necessary for every thoroughly educated man, such as the English language, one or two foreign languages, history, economics and literature. The time has arrived when engineering should take its place as one of the learned professions, and when it should be considered necessary for an engineer to be as broadly cultured as a doctor, a lawyer or a minister.

As to the manner of obtaining this broad and thorough education, differences of opinion will be found among even those best qualified to judge. Probably the advice of the majority would be to go through college and then to take a course in a professional school. My own advice, however, would be to lay out such a course of five or six years in one institution, studying some general subjects and some professional subjects in each year, with an increasing proportion of the latter as the student progresses. There are serious objections, as well as some advantages, in the plan of getting one's education in layers—first a general education and then a professional education. Professional and non-professional subjects are encountered and pursued simultaneously in after life, and why should they be separated in the schools, and studied tandem instead of abreast? The great fault with the ordinary college course is that it fits a man for nothing in particular, and that while pursuing it most men are working with no definite aim. Perhaps it is not exaggerating to say that the average college student (as distinguished from the professional student) looks upon his college course as a period of passive enjoyment. This spirit is in a way demoralizing, and leads to careless habits and a lack of concentration. With entrance into the professional school a different atmosphere is encountered, but why should not this be developed from the beginning? In the mind of the ordinary student, and especially the student who has a practical turn of mind, and is therefore qualified for an engineering career, there is nothing that lends interest to a subject so quickly as to see its application, and the student of engineering should constantly bear in mind that he must study a thing not for mental training merely, but with the object of doing something with it. He should study from the concrete, not the abstract, point of view. The world has become utilitarian, and it is probably generally recognized that the mind can just as well be trained by studying subjects that are of practical use, and with the definite object of making them of practical use, as in the pursuit of scientific or metaphysical abstractions. If these ideas are correct, it follows that, closely following the study of a science, or coincident with it, the student should be made to see at least some of its applications in his professional work.

The introduction of refrigerator cars on the French State Railroads for carrying fish, meat and poultry during the summer months is spoken of as a novelty by Paris journals. Regular rates, plus 10 per cent., are charged for provisions carried in them, and they are attached to certain specified fast trains. We shall civilize Europe yet.

Acetylene Gas Plant of the Great Northern at St. Paul.

The Great Northern has been using for nearly three years a system of train lighting employing compressed acetylene gas. The gas is generated and compressed at central stations, and the cars carry storage tanks or holders which are charged at these central plants. These holders are charged to a pressure of 10 atmospheres, and each tank has a capacity of 212 cu. ft. of free gas at this pressure. There are from two to three holders on each car. Passenger coaches are equipped with from 12 to 16 burners, each burning ½ cu. ft. per hour, which gives from 53 to 71 hours full burning per charge. This is sufficient to make the round trip from St. Paul to the coast, more than 3,600 miles.



Acetylene Gas Generating Plant at the Great Northern Shops—St. Paul, Minn.

To insure safety the tanks on each car are fitted with fusible plugs, and all high pressure piping is made of fusible metal, so that in case of fire these pipes or plugs will melt and allow the gas to burn out without explosion. The Great Northern now has over 150 cars fitted with this system, including day coaches and sleeping, dining, library, baggage and express cars.

The company has just completed a new plant at St. Paul for the production of this gas, a plan and sectional elevation of which are shown in the accompanying engravings. The building is brick with cement floors, occupies a ground space of 30 ft. 6 in.x101. ft 10 in., and is 27 ft. high. Referring to the plan, A is the generator, which is set in a pit 4 ft. below the floor level for greater convenience of charging. This also adds to the convenience of cleaning out, as the pit may be readily washed out with a hose without spattering the sludge over the rest of the room. The generator being 12 ft. high necessitated the building of a platform near the top for charging. This platform is entirely enclosed to prevent the carbide dust from being scattered and deposited through the building. A door opens out to the storage platform. The carbide is received in 1,000-lb. drums and stored on the storage platform, which has a capacity of two carloads. After unloading from the car the drums are handled with an air hoist running on an I-beam the entire length of the storage platform and into the charging room. The carbide is shoveled into the generator, which holds 500 lbs. at a charge.

The Williamson generator, which is used, is a carbide-to-water type, the carbide being fed to it by a screw driven by a water motor. The tail water from this motor passes into the generator and keeps it fully supplied with water while being charged. The generator has a capacity of 2,000 cu. ft. of gas per hour. As the gas is generated it passes out through a 6-in. pipe to a filter, B, which catches the lime dust carried over from the generator. From the filter it passes through the seal, C, to the relief holder, D, which serves to equalize the pressure on the meter, E. From the meter it passes to the large gas holder, F, having a capacity of 2,000 cu. ft. A compressor draws it from the holder through the cooler, G, which serves to condense the moisture in the gas. The compressor delivers to the three storage holders, K, which have a combined capacity of 11,130 cu. ft., when charged to 14 atmospheres.

Between the storage holders and compressor is placed a safety device, which consists of a heavy steel cylinder filled with a porous material, which in case of an accident to the compressor that would cause the striking of a spark within the cylinder, would prevent the explosion from passing to the storage holders. The compressor is a Rand special three-stage, with a capacity of 2,400 cu. ft. of free gas per hour, delivering the gas at 16 atmospheres and a temperature of not over 125 deg. F. It requires for its operation at full capacity 12 h. p.

Steam for running the compressor is taken from two 75-h. p. Morrison internally-fired boilers which also supply the coach yard with steam for heating trains, buildings, etc. From the storage tanks the gas is piped through the coach yard, and filling plugs are located at convenient points. Hose is attached to these plugs and the gas forced into the cars.

No chemical purification of the gas is attempted, as with the form of lamp now used, which passes all products of combustion outside the car, it is found to be unnecessary.

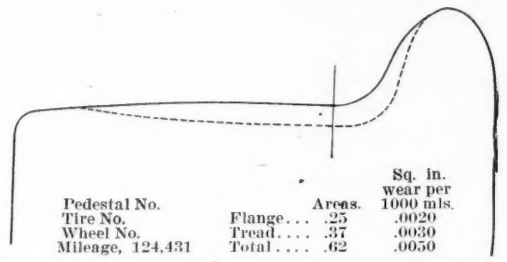
A small room 11 ft. 2 in. wide, between the large holder and the generator rooms, is equipped for repairing lamp fittings, etc., and contains a small lathe, an emery wheel, and other necessary small tools.

Method for Comparative Records of Flange Wear.

A scheme for keeping records of wheel flange and tread wear and of reducing the same to a satisfactory comparative basis has been devised by Mr. E. S. Woods, Vice-President and Manager of the Kindl Car Truck Co. The primary object of the method is to enable comparisons to be made between the flange wear of wheels on trucks equipped with the ordinary rigid side bearings, and those equipped with roller side bearings.

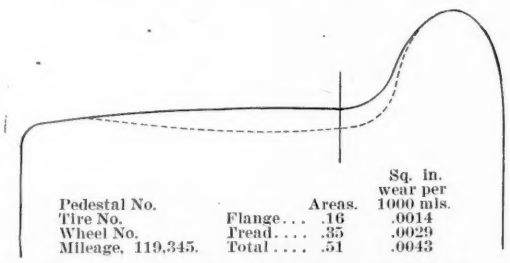
The record sheets, which are 10¾ x 8⅛ in., have two full-size outline sections of the M. C. B. wheel tread and flange, the measurements for a pair of wheels being entered on one sheet. At the top of the sheet are blanks for entries stating whether or not the wheels are on the same axle, name and number of car, axle number, kind of wheels, kind of side bearings, and whether or not side bearings are in contact. Other record items are shown on the sample records which are reproduced herewith.

To obtain the outline of a worn flange and tread, a template is taken by means of a thin lead strip, or some other suitable method. The contour thus obtained is traced on the record diagram, as shown by the dotted line. The area between the two outlines is then obtained by a planimeter, the separation of the flange and tread areas being made at a vertical line drawn through the point where the throat curve becomes tangent to the tread. Then, as shown by the entries within the diagrams, the mileage of the wheel being known, the square inches of wear per thousand miles is readily obtained, enabling comparisons of wear on this basis.



Pedestal No.		Areas.	Sq. in. wear per 1000 mls.
Tire No.	Flange....	.25	.0020
Wheel No.	Tread....	.37	.0030
Mileage, 124,431	Total....	.62	.0050

Section Showing Wear with Solid Sidebearing.



Pedestal No.		Areas.	Sq. in. wear per 1000 mls.
Tire No.	Flange...	.16	.0014
Wheel No.	Tread....	.35	.0029
Mileage, 119,345.	Total....	.51	.0043

Section Showing Wear with Roller Sidebearing.

The two records shown are actual, one being for a roller bearing and the other for a solid bearing, and are therefore for wheels not on the same axle. It will be noted that the square inches of tread wear per 1,000 miles is practically the same in each case, while the flange wear shows a reduction in favor of the roller bearing amounting to 30 per cent.

Waycott Brake-Beam.

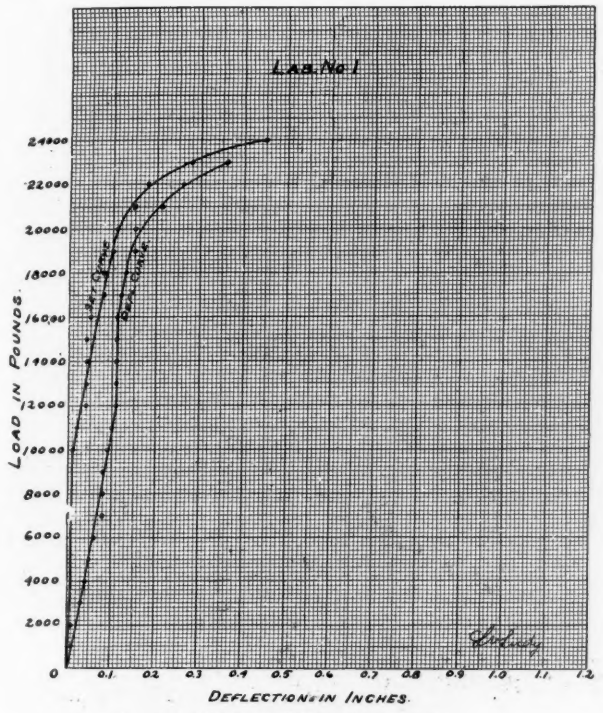
The Damascus Brake-Beam Co., of St. Louis, has recently brought out a new brake-beam, known as the Waycott. It is shown in the accompanying engravings. The success with which the Damascus brake-beam, also made by this company, has been received, has led to the designing of the new type here shown. The Damascus beam is a solid brake-beam made of 5 in. I-beam not trussed, and some 150,000 of this type are already in use. Some roads, however, prefer to use a trussed brake-beam, and this latest design should meet any requirements for this type. The compression member is a 2¼ in. x 2¼ in. x ¼ in. angle and the tension member a 1¾ in. x 1¾ in. x ¼

in. tee. These two members are secured to each other by the brake-shoe heads and a strut in the center which also serves the purpose of a brake lever fulcrum. These parts are made of malleable iron and are riveted through both the members. The brake hanger eyebolts are clamped to both parts of the beam.

The large increase in braking power required on freight cars and on passenger cars as well, due to the introduc-

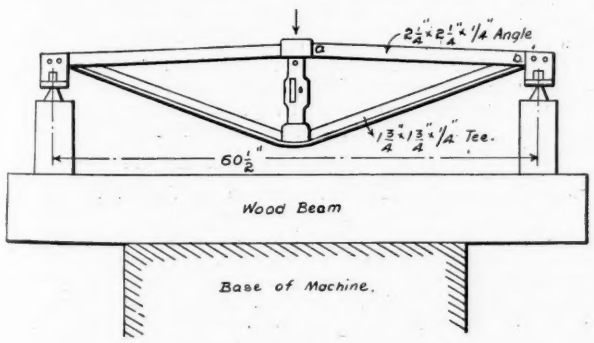
Waycott Brake Beam.

tion of the high speed brake and the use of larger brake cylinders, has caused the failure of many of the older types of brake-beams and necessitated a design of much greater strength for use under cars of large capacity. The Master Car Builders' specifications call for a test load of 7,500 lbs., with a deflection of not more than 1⅛ in. The matter of deflection is not so serious a one



Test of Waycott Brake Beam.

as the matter of ultimate strength, since the deflection simply requires an increase in the piston travel in order to take up the slack, while a lack of ultimate strength means failure of the beam. To determine the strength and deflection of this new beam, two sample beams were tested recently at Purdue University. The beams were supported, as shown, on two knife edges resting on steel plates at a distance of 60½ in., this being the standard distance from center to center of brake-shoes. The steel plates rested on a 15 in. x 20 in. beam placed on the base plate of the 300,000 lb. Riehle testing machine. The



Method of Supporting Beam for Test.

load during the test was applied in steps of 1,000 lbs., but before taking any observations for record a load of 7,000 lbs. was applied and then removed, to take up any slack in the parts. The deflections were read simultaneously with each application of the load and the permanent set observed on the release. A summary of the tests and a running log are given below. The results are shown graphically in the stress strain diagrams, which show the application curve and the release curve. It will be observed that this beam failed by the buckling of the compression member at a load more than three times that required in the Master Car Builders' specifications.

	No. 1.	No. 2.
Weight of beams in pounds.....	62.5	62¾
Load in pounds at elastic limit.....	20,000	20,000
Deflection in inches at elastic limit..	.15	.28
Set in inches at elastic limit.....	.11	.17
Load in pounds at point of failure...	24,000	23,000

Running Log.

Flexure Test of Damascus Truss Brake-beam.

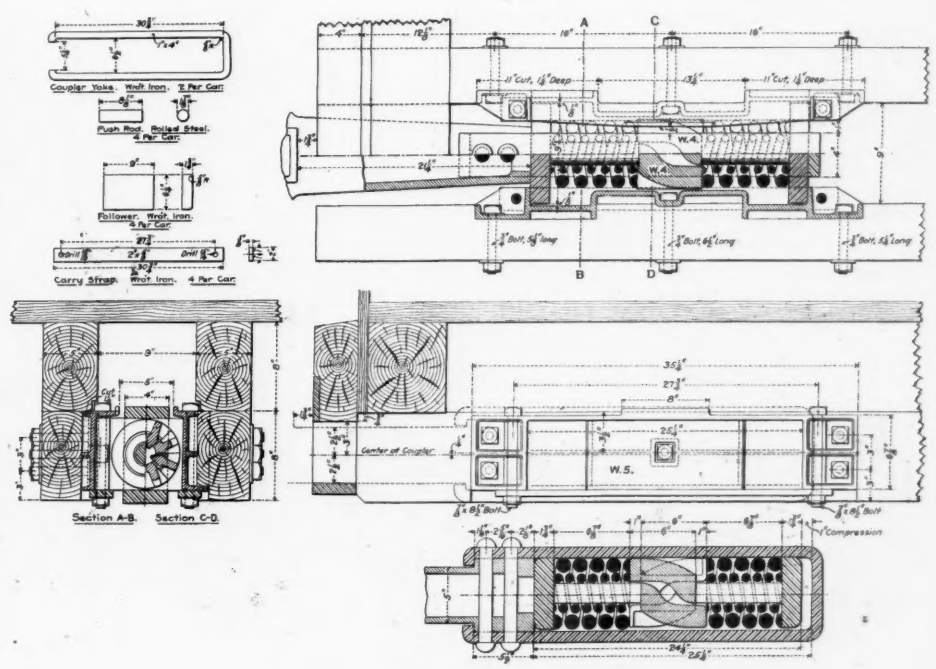
Load in lbs.	Deflection in ins.	Set in ins.	Load in lbs.	Deflection in ins.	Set in ins.
0	0	0	13,000	0.11	0.04
1,000	0.01	0	14,000	0.11	0.04
2,000	0.01	0	15,000	0.11	0.04
3,000	0.03	0	16,000	0.11	0.05
4,000	0.04	0	17,000	0.12	0.08
5,000	0.05	0	18,000	0.13	0.08
6,000	0.06	0	19,000	0.15	0.10
7,000	0.08	0	20,000	0.15	0.11
8,000	0.08	0	21,000	0.21	0.15
9,000	0.08	0	22,000	0.26	0.18
10,000	0.09	0.01	23,000	0.36	0.28
11,000	0.10	0.02	24,000	*	0.45
12,000	0.11	0.04	....	...	...

*Compression member buckled at (a) and (b). See Fig. 1.

Street Tandem and Twin Spring Draft Gears.

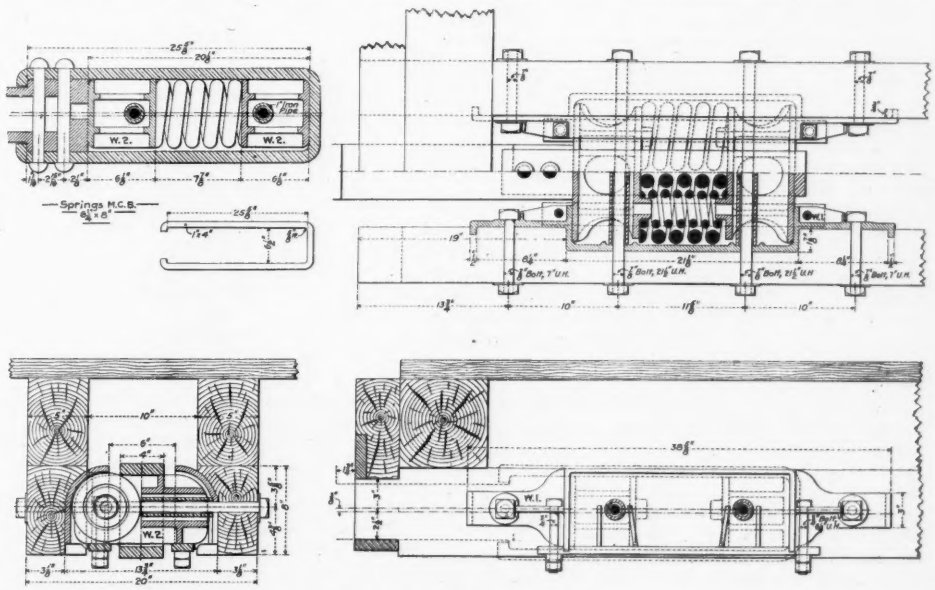
The accompanying illustrations show two forms of draft gear recently patented by C. F. Street and now being applied on a large number of cars. The first is a twin spring arrangement as applied to wooden sills. It consists essentially of two sill plates and follower stops combined, two followers and two standard M. C. B. double coil draft springs. It is made in either malleable iron or steel. The sill plates are cast with pockets at each end to act as follower stops. Through the web which re-enforces the stop lug a ¾ in. bolt is passed which supports the follower carry irons. The followers are made in box form and provided with suitable openings through which pass an iron pipe spreader surrounding the sill tie bolts. The sill plates are gained into the draft sills 1⅞ in. and are secured by two ⅞ in. bolts besides the two sill tie bolts. The great advantage of this construction is that it ties the draft sills rigidly together at the point where they are subjected to the greatest buckling strain.

The second type shown is a tandem spring gear which accomplishes the movement of the center followers in a novel manner. The draft sills of malleable iron or steel have a double gain into the sills 1¼ in. and are secured by three ¾ in. bolts. The front and rear followers are of the usual form 1¾ in. x 6¼ in. x 9 in. wrought iron supported on carry straps bolted to the sill plates. The spring seats between the two springs are made of cast-steel and each of them has four prongs which interlock and allow a movement of 2 in. in either direction for each spring. The points of the prongs bear on a compressing plunger of rolled steel 1⅞ in. in diameter which passes through the center of the spring and transmits the motion of the front or rear follower, as the case may be, to the rear or front spring through the spring seats. Under buffing shocks the front follower is pressed back by the coupler carrying with it the front plunger. The plunger carries its spring seat back against the rear spring and compresses it against the rear follower, which bears on the stops cast in the sill plate. The forward spring is compressed by the front follower and bears rigidly against its spring seat, which in turn bears on the plunger inside the rear spring, the plunger being fast against the rear follower. The operation in pulling is simply reversed, the front follower being fast against the stops and the movement of the coupler communicated through the yoke to the rear follower. Any side movement of the spring seats or springs is prevented by large bearing surface on the sill plates.



Street Tandem Spring Draft Gear.

Both of these devices are simple and strong. They may be easily applied to steel sills with only a slight change in the form of sill plates. Several thousand cars have already been equipped. Mr. Street, the patentee, is manager of the railroad department of the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, which makes these gears.



Street Twin Spring Draft Gear.

The International Sleeping Car Co., the European Pullman, earned gross last year about $2,870,000, and net $1,350,000, of which latter about $200,000 was from its hotels. These figures are modest compared with the $20,000,000 gross and $9,000,000 net of the Pullman Co., which, however, probably made a dollar or two from its car-building works.

The Forsyth Automatic Air and Steam Coupling.

Ever since the automatic car coupler has come into use the desirability of a device whereby the connections of the air, steam and signal lines might be automatically formed has been recognized. However, the problem presented some serious difficulties and considerable thought and experiment have been given to efforts to produce a device that would meet the demands of service conditions.

The contrivance which we illustrate herewith is the invention of Mr. J. E. Forsyth, of Chicago, developed after years of study and experiment. The principal feature of distinction observable in examining this coupling is the all-metal connections. Each pipe has three flexible metallic joints, the location of which may be seen from any one of the engravings. These joints have been separately patented by Mr. Forsyth, and though simple in construction have proved entirely satisfactory after months of service.

The device is made up of a malleable iron head having diagonal guide horns; a combination brace and hanger of malleable iron, attached to the drawbar stem; a cone-shaped helical spring, and the flexible joint pipe connections already referred to.

The malleable heads, being cast from the same pattern, are interchangeable. It will be noted that each guide horn has a shoulder formed on that edge which joins the body at its short diameter, the purpose of which is to insure a rigidity of alignment when the couplings are in service. The head is supported by the cone-shaped helical spring which is secured at its rear end to the brace, the latter being formed into a heavy ring at this point to enable attachment of the spring. The form of this brace and the method of clamping it on the stem of the drawbar are clearly seen in the illustrations. A modification of the present form is contemplated by Mr. Forsyth to increase its rigidity. Instead of the double bend now used, it will drop straight down from the drawbar stem as far as the center of the coupling, and turning at right angles it will be forked to meet the spring-supporting ring on its rear face at two points in the plane of its horizontal diameter.

The signal, air and steam openings in the head are placed in the order named from the top down. Between the steam and air openings an air chamber is formed in the casting to protect the soft rubber gaskets of the two upper lines from the heat of the steam. The usual hard rubber gasket is used for the steam joint, and an automatic-drip is placed in the head under the steam line to release the condensed steam whenever the pressure is off.

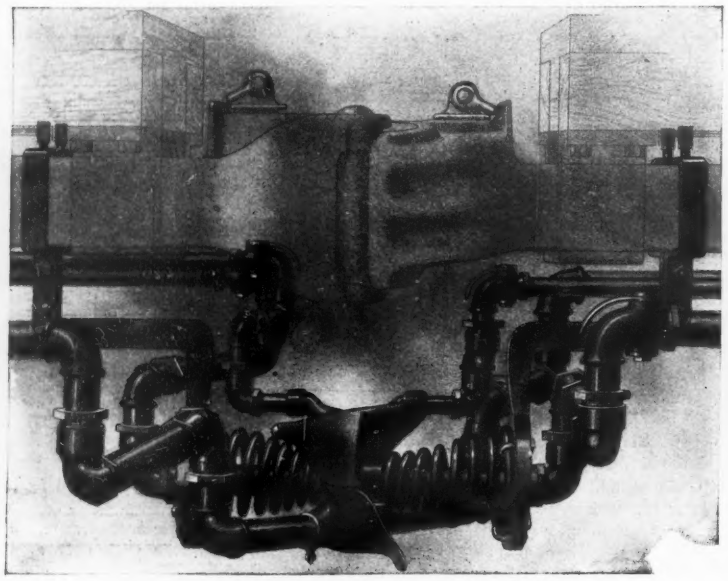
When a coupling is made each helical spring is compressed 1¾ in., this being the pressure with which the heads are held together. It has already been mentioned that the springs support the heads by attachment at the outer or smaller end of the helix. This being the only support the heads have, the flexibility which this allows will be readily appreciated. In connection with the flexible metallic joints free movement to meet all variations in heights of cars and conditions on curves is obtained.

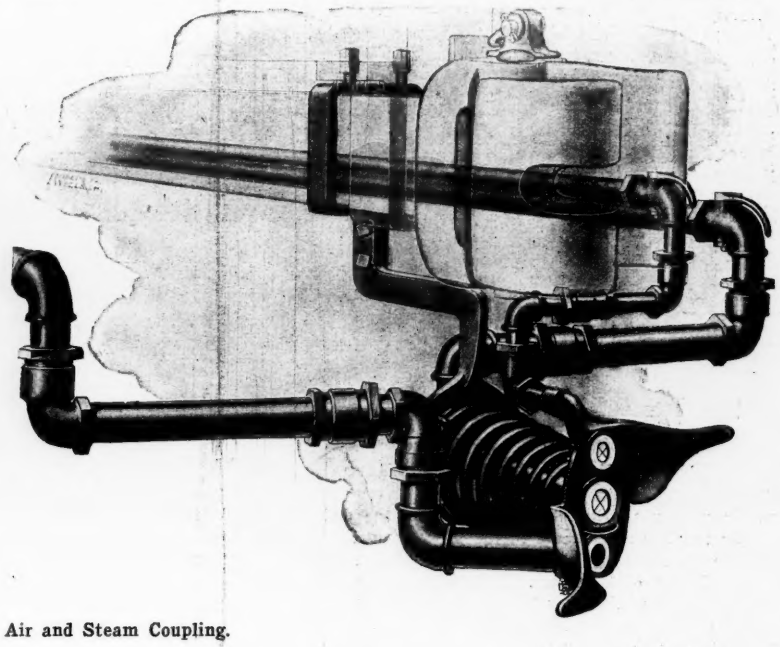
The air pipe enters the head along the axis of the spring. In order to put a slight initial compression on the spring and maintain the coupling in horizontal alignment when uncoupled, a stop in the form of a ring having two fingers projecting oppositely and diametrically outward is placed on the air pipe in front of the last ell and just back of the spring base, the fingers bearing against the rear face of the latter.

For the purpose of interchange with passenger cars not equipped with the automatic coupler an emergency head is furnished to which hose connection can easily be made. Couplings for freight equipment have but one opening in the head, that for the air line, which is placed in the center. The freight couplings are so adjusted that these cars may be coupled to passenger cars when the exigencies of service require it.

The "Alton Limited" trains of the Chicago & Alton, running between Chicago and St. Louis, are equipped with these couplings, which are also in use on the St. Louis & San Francisco, and are specified on the new passenger cars now being built by the American Car & Foundry Co. for the Chicago & Eastern Illinois.

It will be seen that but slight changes are required in applying the couplings to a car, and the makers say a five-car train can be equipped complete in a single day. The Forsyth Automatic Air & Steam Coupler Co., Chicago, is handling the device, which will be on exhibition at the Saratoga conventions.





The Forsyth Automatic Air and Steam Coupling.

Best Method of Setting Flues.*

It is well known that when the flue sheet is drilled, the flue holes are full of oil, and unless the hole is perfectly smooth from the cutter, it is hard to get the oil out of the metal, and unless the hole is perfectly smooth it is difficult to make a flue tight. It may be made tight for a while, but as soon as the flue contracts enough to leak, mud gets around the hole and in the rough parts and forms a scale which will stay there, after which it is impossible to make the flues perfectly tight, resulting in the necessity of rolling flues every trip.

We wipe the flue holes clean, file off the burr, if any, and roll the copper light with the "Boss" flue roller (using one concave roller which answers the purpose of a section expander and two straight rollers). By using the concave roller it turns the ferrule over on the inside of the sheet and gives a good chance to drive the flue in with two or three light blows with a 6-lb. mallet, making a perfectly tight fit. When straight rollers are used in rolling copper ferrules the life is rolled out of the ferrule so that it will stay in the hole, in order to drive in the flue.

The flues are now in the boiler. The next step is to lip them with a ⅞ in. or 1 in. bolt about 12 in. long, by putting the bolt in the flue and hitting it with a hammer instead of using the pean of the hammer. When a flue is worked down on the sheet, the bead is cut off or partly broken off by the time it is ready for beading. I believe in using a 1¼ in. pean hammer in turning the flue over and work only the extreme edge of the flue; then the thickness of the flue will be obtained at the edge of the sheet as well as on the end of the flue. We now roll them. Care should be taken so that the flue is not rolled too hard, for if this is done, the metal is worn out before the engine has seen service. The flue is then beaded by using an air hammer.

We have no trouble with our front flue sheets. We line our flues up with common sheet-iron liners and roll them with straight rollers. The longest flue is 13 ft. We usually find them collapsed from being mud burned, but in the smaller engines this seldom occurs; therefore the longer the flue the easier it is weighted down with mud, and in places keeps the water from getting to them properly. When the flue is from 14 ft. to 19 ft. long and in places where the water is not very good, two braces should be applied in the center of the shell, spacing them off between front and back flue sheet, and keeping the weight of the top half of the flues off of the bottom half.

Every boiler should have not less than two 6 in. holes at the bottom of the shell, one at front and one at back end, for washing out purposes. There is a great deal of flue leaking caused from dampers not being properly used, especially on cinder pits. The dampers should always be closed while engines are standing on side tracks.

The more a flue is rolled the weaker it becomes, consequently they become so thin that it does no good to roll or calk them, and the next thing is the flue plug. There are a great many instances where the roundhouse boiler maker is at fault in not keeping his beading tool in good condition. He allows it to become flat and worn out, and when a tool becomes so badly worn it burrs the flue with every stroke of the hammer and drives it away from the sheet.

*From a report to the Master Boiler Makers' convention by Wm. L. Borneman, C., I. & W. shops, Indianapolis, Ind.

Exports and Imports of Iron and Steel.

The exports and imports of iron and steel for the month of April, 1903, as published by the Bureau of Statistics, show a small decrease in the import of iron ore, and a large increase in the import of pig iron. The following table gives the more important figures:

Imports.

	April.		Ten mos. ending April.	
	1902.	1903.	1902.	1903.
Iron ore, tons..	116,731	49,086	944,218	820,814
Pig iron, tons..	19,067	99,944	95,795	825,214
Steel bars, lbs.	26,849,903	64,991,405	68,220,112	722,588,724

Exports.

	April.		Ten months ending April.	
	1902.	1903.	1902.	1903.
Iron ore, tons	8,528	49	56,338	74,211
Pig iron, tons	1,570	1,143	50,940	15,723
Ingots, blooms, billets, tons..	68	54	2,498	2,040
Structural steel, tons	4,805	2,234	55,876	26,978

During April there were exported 802 car wheels as against 1,866 during April of the previous year, and during the 10 months ending with April, the total number of car wheels exported was 18,241 against 19,974. The number of locomotives shipped out of the United States during April was 36, as against 38 the previous year. Of this number, 25 went to Mexico, six to Canada, four to China and one to Cuba. Locomotives exported during the last 10 months numbered 266, as against 324 during the same period of 1902. Two-thirds of this number went to Mexico and Canada, while in 1902 the greater part went to Japan, Cuba and the South American Republics. These locomotive exports were valued at $2,998,491. The value of locomotives exported during the same period last year was $2,931,767. The average price which we arrive at by dividing the figures just given by the number of locomotives sent abroad in each of those years was $11,272 per locomotive in 1903, and $9,049 in 1902.

The Standard Code on the Lehigh Valley.

The Lehigh Valley has issued a new book of rules for the operating department, and it went into effect on May 17. The book consists of 172 pages, the "General regulations" being rather brief. The standard code proper (Rules 1 to 106; 151 to 153; and 201 to 223) conforms quite closely to the American Railway Association forms. The "General notice" is placed at the beginning, but the "General rules" come after the standard code proper, and form the introduction to the "General regulations." In these general regulations there are three, M, N, O, not shown in the standard code. Rule M refers to physical and mental qualifications; Rule N forbids the employment of minors or persons over 35 years old, except with the approval of the General Superintendent; Rule O regulates the re-employment of persons who have been dismissed. Commencing with the beginning of the book, the definitions of terms used in train rules and of those used in signaling are placed together. In the train rules those with the letter D prefixed, which refer to double track practice, are incorporated with the older rules; for example, D 17 follows 17. This arrangement is rather clumsy, as in most cases the single track rule and the double track rule are alike except in one or two brief sentences. Rule 99 is in the short form laid down in the Association code.

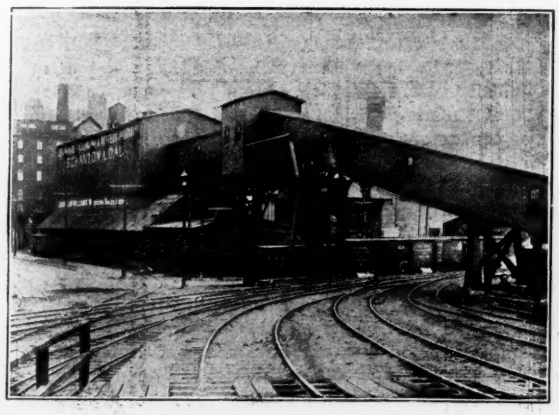
Rule 221 provides for a train order signal standing normally in the "proceed" position.

The Telegraph block system rules (301-375) conform quite closely to the Association standard. The Automatic block system rules (501-578) include instructions for the guidance of trainmen in entering and leaving side tracks, the principal clause of which is that "No switch shall be opened without taking precaution for protection as prescribed by Rules 99 and D 152." Rule 518 reads: "In foggy or stormy weather when signals cannot be seen plainly the signals must be approached cautiously, so that enginemen and trainmen can see and interpret them correctly, always bearing in mind that safety is of greater importance than making time." The last clause is set in small capitals.

The interlocking rules are numbers 601-602; 611-636; 661-669; and 681-686. These are followed by seven diagrams of junctions and cross overs. The "General regulations," as before stated, are quite brief, those for telegraph operators being embraced in about 650 words. Those for enginemen take up about the same space. A rule that is wholly new is rare, indeed; but we believe we have found one here, in the requirement that, when the conductor is disabled and the engineman is obliged to take charge of the train, "if there is more than one engine the senior engineman will assume the conductor's duties."

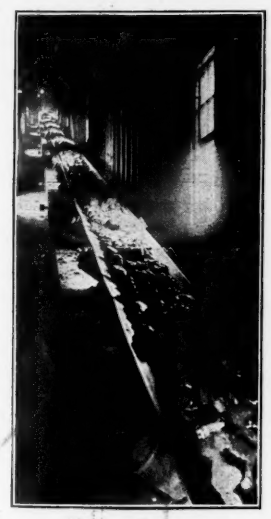
Lackawanna Coal Pocket at Buffalo.

The accompanying cuts show the retail coal pocket of the Delaware, Lackawanna & Western at the foot of Erie street, Buffalo, which is now equipped with a 20-in. Robins belt conveyor. Previous to the installation of this



Lackawanna Coal Pocket.

conveyor the company had for years used a two-track trestle which crossed Erie street, and then stretched over the coal pockets. The coal was delivered to the bins from hopper-bottomed cars which were pulled up the incline by means of a cable, and hoisting engine. The cars traveling up the incline used one track, and in returning to the railroad yard used the other. These inclines occupied a great deal of yard space, and there was always the danger of a car breaking loose, running down the incline and doing considerable damage. This latter track with the trestle which supported it was removed about a year ago, and the conveyor installed on the trestle which had previously supported the loaded coal cars. Although the trestle, by long usage, had become unsafe for the passage of the heavy coal cars, it was more than sufficient for the light conveyor.



Robins Conveyor.

Further information in regard to the plant may be had from the Robins Conveying Belt Co., 17 Park Row, by whom the conveyor was installed.

Bulging of Side Sheets and Pitting.*

The bulging of side sheets is a defect which is causing much trouble and expense in some sections of the country and there seems to be a difference of opinion as to the cause. It is a common thing to see sheets bulge that are not encrusted with scale to any extent. It has been the custom to leave the side sheets as thin as practicable in order to conduct the heat faster and at the same time the pressure and the rate of combustion have increased until the heat is conducted through the sheets so rapidly that it cannot be taken care of by the process of convection, or by the hot water coming to the top and the cold water going to the bottom, on account of the narrow water space and the staybolts which prevent a free circulation, thereby not carrying the small steam bubbles, which are formed near the heating surface, to the top as fast as they are formed. The larger the number of these bubbles that accumulate at the heating surface, the less dense the water becomes, until the sheet becomes heated and is bulged by the pressure. When the water comes back and cools the sheet it makes it very brittle and leaves an internal stress in the sheet, caused by part of the sheet being cold while the other part is heated.

I do not think it advisable to increase the thickness of sheets except in localities where bulging occurs, as experience has shown us that the same class of engines are differently affected in different localities. Where a certain kind of water is used the sheets do not bulge to any extent, while in other sections, where the water is different the side sheets will bulge in a short time, and before much scale is formed. As the lighter sheets are the most valuable heating surface they are to be preferred in localities where they do not bulge.

Pitting, which takes place on the inside of boilers, is a common defect in some sections. The theory that is accepted by a great many with regard to the cause of pitting is, that the boiler water becomes acidulated and a galvanic action takes place in the boiler by which the non-homogeneous portions of the steel are decomposed, leaving the pit holes. This is often the source of expensive repairs. The practice of letting boilers go out of the shop with leaky rivet heads or seams is a source of great expense, as it causes corrosion, and especially is this true at the bottom of fire-boxes back of the grate-bars, where it keeps the ashes damp. To prevent rust or corrosion on the outside of boilers they should be kept dry. A small leak that just keeps the metal damp will produce more rust than a larger one.

*Abstract of a report by Mr. R. C. Young, C. & N. W., to the Master Boiler Makers' convention.

Durability of Treated Ties.

The Atchison, Topeka & Santa Fe sends the following statistics to show the service of treated pine ties. From 1885 to 1889, the Wellhouse process was employed; during the next three years the process is described as "Wellhouse burnetizing," from 1893 to 1900, Wellhouse, and during 1901 and 1902 the ties were burnetized.

Record of Pine Ties Taken out of Track during 1902.

Year treated.	Ties removed because of— Decay.	Other causes.
1885	5,878	14
1886	6,410	236
1887	10,204	125
1888	10,802	94
1889	6,952	225
1890	11,604	81
1891	13,525	419
1892	23,294	1,009
1893	19,098	1,122
1894	13,562	754
1895	9,795	103
1896	7,967	489
1897	1,871	106
1898	1,850	1,361
1899	364	858
1900	147	379
1901	114	947
1902	...	557*

*The number of ties taken out owing to ballasting on the New Mexico division, during 1902, was unusually great, as the rule was that all ties not good for two years more should be replaced.

Average Yearly Service Since 1897, *Based on Ties Removed on Account of Decay.*

	Average of all divisions. Years.		Average of all divisions. Years.
1902	10.70	1899	10.61
1901	10.58	1898	10.56
1900	10.78	1897*	10.18

*Last 9 months.

Treated Pine Cross Ties Laid in Track Each Year Since 1897; *Also Those Treated in the Years Shown Which Have Been Removed for Reasons Stated.*

Year in which treated and laid in track.	Taken out between March 1, 1897, and Dec. 31, 1902. —Entered against year in which they were treated. Rotten.	Other causes.	Total.	Still in track on Jan. 1, 1903.
1897— 270,581	2,187	244	2,431	268,150
1898— 648,184	1,988	1,614	3,602	644,582
1899—1,010,345	385	1,159	1,544	1,008,801
1900—1,162,509	152	973	1,125	1,161,384
1901—1,061,234	116	1,020	1,136	1,060,098
1902—1,040,455	...	557	557	1,039,898
Total .5,193,308	4,828	5,567	10,395	5,182,913

NOTE.—No statistics were kept prior to 1897 of treated ties taken out, consequently this statement does not show the proportion that the total number taken out to date bears to the total number originally put in, it can only show the average service of those removed, excepting since 1897, and for this period the total number put in and removed for cause is given.

Construction of Boilers.*

The limit has been reached in the way of high pressure in a locomotive boiler. There is no doubt but that a boiler can be made to carry higher pressure, but it would not pay.

We are in favor of the straight top boiler, with an ordinary wide fire-box, radial stayed. The outside casing of the fire-box should be made of 5/8 in. steel running from mud-bar to mud-bar, without a seam. It should be 70⅛ in. inside measurement at the center line of boiler, and should spread 2 in. on each side down to the mud-bar, and drop about 26 in. below the bottom of the boiler. The throat sheet should be ¾ in. steel, riveted to the casing with a double row of rivets. The cylindrical part of the boiler should be made of 11/16 in. material in two courses—the front course 66 in. inside diameter. Triple riveted butt lap seams should be used and all circumferential seams should be double riveted. The dome should be ahead of the connection sheet and fastened to the boiler with a 1¼ in. pressed steel collar, the top to be made of the same material pressed. The lap of the dome should be welded.

A space of 22½ in. should be allowed between the top of the boiler and the top of the front end of the fire-box, and the fire-box should drop 2½ in. at the door sheet. The top of flue and door sheet should have a radius of about 72 in. and the corners 10 in. The fire-box will be about 74 in. from the bottom of the mud-bar to the crown sheet, and about 114 in. inside length, and 59 in. width at the center line of the boiler. We can put in 280—2 in. flues 14 ft. long. There will be in this boiler 52½ ft. of grate surface and about 2,000 ft. of heating surface, or 38 ft. of heating to 1 ft. of grate surface.

The staybolts for ends and inside of box should be 15/16 in. in diameter and have the threads cleaned off between sheets and a tell-tale hole drilled in the outside end of the bolt for the radial stays. The staybolt iron should be ⅞ in. in diameter and staved up at ends for a 1 in. thread. Both ends of the bolt should be hammered up, using no head or nut on the stay. All longitudinal braces should have cast-iron jaws for fastening to the braces.

The above boiler will meet requirements under ordinary conditions, and it can be built cheaply and the round-house repairs will be reduced. In making a boiler of this type the best tools should be used, with a liberal supply of air tools, such as calking and riveting hammers and air riveters. There should be two combined punches and shears, a cutting off or splitting shear and a 20 ft. sheet planer, a four spindle radial drill press and two single spindle drills, two sets of bending rolls of 12 ft. and 16 ft. clearance between housings, a hydraulic plant with a riveter and flanging press, one horizontal hydraulic punch and a mud-bar riveter.

*From a report by Mr. W. A. Timens, presented at the 1903 convention of the Master Boiler Makers.

Foreign Railroad Notes.

The temperance movement seems to make some progress in Germany, where a lecturer on the importance of German drinking customs for railroad men and the traveling public has been published and circulated by an organization having the familiar name of "Good Templars." Among other customs condemned in the lecture is that of passengers treating railroad men while on duty—which, we imagine, is too rare in this country to be called a "custom."

The whole of the Siberian and Manchurian Railways have cost Russia about 83 millions sterling, just about one-third of the cost of the South African war. The Odessa correspondent of the London *Standard* points out the flagrant jobbery and corruption which attended the construction, but we venture to say the venality was not a whit worse than might be unearthed in connection with our own war contracts, the construction of the Uganda Railway, and even such respectable undertakings as the Manchester Ship Canal. Nothing illegal, of course; nothing ever is, until found out. But the estimates are doubled and trebled all the same, owing to "unforeseen circumstances."—*Herapath's Journal.*

The women employees of the Austrian State Railroads recently held a convention in Vienna and formulated their claims as follows: The scale of wages and provisions for pensions should be revised and placed on a uniform basis. The women employees of corresponding training, duties and hours of service should be embodied in the regular corps of permanent employees, and after two years probationary service should receive definite appointments with $240 pay yearly and a 30 per cent. allowance for house rent. They should be entitled to promotion for the same service and qualifications as entitle the men employees to promotion. They should have every other Sunday to themselves. (Many are ticket sellers, and at many stations twice as many tickets are sold on Sundays as on other days.) They should be permitted to marry.

The Russian Ministry of Transportation has made a contract for 12 years with the International Sleeping Car Co., by which from April 1 of this year that company is to despatch five fast trains each way weekly between Moscow and the eastern terminus of the Siberian Railroad; seven weekly after April 1, 1904, and after Jan. 1, 1905, special limited trains (trains de luxe) through over the Chinese Eastern Railroad to the Pacific. For its accommodations the sleeping car company is authorized to collect from the passenger at the rate of 5 kopeks per verst first-class and 4 kopeks second-class, which is a little more than ¾ cent per mile first-class and 0.6 cent second-class. It is about 5,200 miles from Moscow to the Pacific, so a first-class sleeping car ticket will cost about $39.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

A systematic police organization is not frequent on American railroads and yet its demonstrated value and economy are well shown by Mr. Josiah Flynt Willard under his better-known pseudonym, "Josiah Flynt," in another column. The railroad officer who fails to read this article misses something. Mr. Willard shows that on the two great railroads of which he has special knowledge, a systematic police organization actually costs less than the pre-existing employment of "detectives," while at the same time it is about fifteen times as effective in punishing trespass, robbery, larceny, intoxication, disorderly conduct, destroying property and stoning trains; and tramps and train riding are almost wholly eliminated. These astonishing results are accomplished by having—instead of "sleuths" chosen on the principle that it takes a thief to catch a thief—an organization, military in form, of trustworthy, self-respecting men, picked out with the same regard for ability and character as are other railroad officers. The saving of life and of loss and damage is made clear, but Mr. Willard does not point out the emergency value to a railroad of having always ready at hand the skeleton of an army for defense in times of strike riots and anarchy. Such defense is strictly lawful, is often shown to be necessary, and the lack of it has been indeed costly. It is a plain duty to see to it that, in the language of Job, "They that plough iniquity and sow wickedness reap the same," when law is powerless.

Observations without number have been made on wheel flange wear, and in most cases some sort of record of the results has probably been kept, but so far as we know there has been, up to the present time, no successful effort made to reduce these data to a basis that would enable satisfactory comparisons to be made. In 1898 the Lake Shore obtained some data on tread and flange wear in testing the merits of a roller side bearing, observations being made on the amount of wear on the wheels of the trucks equipped with the roller bearings, and of other wheels on trucks having plain side bearings. Plaster casts were taken of the contour of the treads and flanges before the wheels were put into service, and again after several months of wear. Tracings from the outlines of these casts gave a graphical record of the amount of wear on each tire, which together with the mileage made by each, furnished a basis for comparison. But had these results been reduced to some unit basis, such as the amount of reduction of cross-section of tire, expressed in square inches per thousand miles, it would have enabled a more accurate comparison of results. In another column is given an outline of a scheme for keeping records of wheel and flange wear and of reducing them to such a basis. The value of records so obtained is based on the assumption that these records are grouped with regard to similarity of service, and that hard and soft tires, or chills, will balance each other. With a sufficient number of observations taken in this way it is reasonable to suppose that reliable information may be obtained.

Mr. Garrettson of the Order of Railway Conductors, in demanding from the Great Northern double train crews on trains handled with two engines, used the following language:

> Now I might just as well come to the root of the matter, because the real root is that while he recognizes the right of the Company to limit the number of crews by large engines—in other words, the transporting ability of a given crew if they get power large enough, he does not recognize the right of the Company to limit the number of crews by making one crew handle a train hauled by two or more engines.
>
> The essence of this movement is to put on more crews. It will be just as tenable a position to say that when we limited the day to ten hours—and it took a great deal longer to limit the day to ten hours than in most other propositions—we were providing for the employment of more crews. When we limited the mileage made by freight trains or local trains and passenger trains we had precisely the same thing. We made employment for more men.

In this connection a bit of history will be interesting: In 1705 Thomas Newcomer invented the first engine having a piston moving in a cylinder. The pressure on the piston head was about seven pounds per square inch. The power depended entirely on the magnitude of the piston, and being independent of highly elastic steam, would not expose the materials to destructive heat. The machine made two points necessary: First, to make a speedy and effectual vacuum below the piston in the descent, accomplished by condensing the steam in the cylinder by the introduction therein of a jet of water. Second, to contrive a counterpoise for the atmosphere in the descent; and this was easily accomplished by utilizing the elastic force of the same steam previous to condensation. The manipulation necessary for working this engine was therefore the alternate opening and closing of two valves—the regulating and condensing valves. This duty, requiring no great amount of labor or skill, was usually intrusted to boys, called "cock boys." It is said that a lad named Humphrey Potter was employed to work the cocks of one of the Newcomer engines, and being tempted to escape from the monotonous drudgery to which his duty confined him, and indulge his disposition to play, tied strings of proper length to the working beam and to the levers governing the cocks, by which the steam engine for the first time became an automaton, the beam opening and closing the cocks with the most perfect regularity and certainty as it moved upward and downward. This contrivance of Potter was very soon improved by the substitution of a bar called a "plug frame," which was suspended from the arm of the beam, and which carried upon it pins by which the arms of the levers governing the cocks were struck as the plug frame ascended and descended, so as to be opened and closed at the proper time. Besides making the machine independent of manual superintendence this process conferred upon it much greater regularity of performance than any manual superintendence could ensure.

The use of pushing engines was introduced on the English roads in the early thirties, and until this year it has never occurred to anyone that there was any good reason why extra train men should be used in connection with them any more than it occurred to anyone that "cock boys" should be added to the engine crews. If we are to go back to 1830 to restore labor dispensed with by invention, why not go back to 1700 and put the Brotherhood of Locomotive Engineers on the same plane as the Order of Railway Conductors. To the ordinary man, to the owner and to the consumer, the railroads have no more industrial necessity for the "cock boy" or the double crew than a dog has for fleas. They are not workers; they are not even drones—they are parasites, pure and simple. However, it may work toward a good end. In these columns May 8 was given a description of the duties of the brakeman, and it was seen that he spent a small proportionate time in useful service. The hardship of employing four men to do the work of one in the train crew might be expected to continue for some time through force of habit, but when it comes to employing eight men to do the work of one it may be expected that an early opportunity will be taken to reduce the crew to an economical basis.

Joint Responsibility of Conductor and Engineman.

A San Francisco correspondent writes that the Southern Pacific Company has issued an order requiring conductors to ride in the cabs of engines as much as possible, and to be with the engineer at all meeting points. The order says that as collectors are provided on passenger trains, the conductors can devote their entire time to the safety of their trains. The engineers resent the order as an insinuation that they are untrustworthy, and the conductors object to riding on the engines on account of the uncomfortable quarters; and they assert that their uniforms will be ruined in the cabs. The matter was referred to the Grievance Committee of the Order of Railway Conductors, Golden Gate Division 264, of San Francisco. The committee has asked General Manager Agler to rescind the order.

These conductors must be extremely shortsighted. The complaint about uniforms seems childish, for common sense teaches that the complete safety of trains is difficult to secure, and demands heroic measures. One of the most important rules in the Code is No. 105, which reads:

> Both conductors and enginemen are responsible for the safety of their trains and, under conditions not provided for by the rules, must take every precaution for their protection.

Or, as in the code of the Cincinnati, New Orleans & Texas Pacific—

> Conductors and enginemen will be held equally responsible for the violation of any of the rules governing the safety of their trains, and they must take every precaution for the protection of their trains, even if not provided for by the rules.

But this is a rule that is generally disregarded; at least its spirit is practically ignored; for in spirit it requires that conductors and enginemen shall confer at every important juncture, so that each may be sure that he and his fellow-custodian are working in unison. Instead of this, however, these men too often act independently of each other; and so we have a thousand collisions reported in the Government Accident Bulletin every three months.

In the latest of these Government reports (Bulletin No. 6, for the last three months of 1902) seven butting collisions were specified, killing 14 persons, injuring 26 and costing $69,500, which were due to the failure of conductors and enginemen to properly co-operate with each other. The causes of these collisions are noted in items 5, 13, 15, 22, 25, 26 and 27, in the table shown on page 5 of the Bulletin. In one case an engineman saw a dead engine on a side track, and by mistake took it for the head of a train which he was to meet; in another, the conductor and engineman both failed to ask for a clearance card; in item 15 the main fault was laid on a brakeman, who went ahead to flag but who neglected to use torpedoes; but the conductor and engineman were held responsible for not having provided torpedoes. In another case the engineman took the word of the conductor instead of doing his own duty himself; in another an inexperienced engineman on a dark night "lost his location" and his error was not checked by the conductor; and so on, through a long list of causes familiar to the reader conversant with these things. Bulletins 5 and 4 contain similar lists; and in the nine months covered by these three bulletins we find collisions due to this particular cause aggregating over $150,000 in damages to cars and engines, and causing 28 deaths. The reader will, of course, bear in mind that the cases here cited are only those few in which the cause was specific forgetfulness of matters which should have been the subject of conference or co-operation between the conductor and the engineman. Moreover, the whole list embraces only a small portion of all the collisions for a given period and a still smaller portion of the errors and neglects which are chargeable to conductors and enginemen.

The Southern Pacific order may be a practicable means of reducing this list of blunders. The older and more level-headed conductors see this, and should have voice and influence. It would be well to lay before their Lodge the records of the past; of the great number of fatal blunders that have been made by conductors and enginemen as good and as wise as themselves. It is difficult for men to be eternally conscious that one blunder or lapse can destroy the reputation of a lifetime; and that if one kills a dozen passengers it may blast his happiness for life, regardless of mere salary or reputation; and for this reason an occasional glance at the past history of blundering conductors is very salutary. It is, indeed, humiliating to have the superintendent take such means as this to enforce the performance of simple duties; but, the necessity being recognized, it is well to submit to it. A conductor had better ride in the cab, enveloped in overalls and jumper, to the end of his life than forget a meeting point and maim people. Not many passenger conductors have the privilege of taking this measure of safety, for not many roads are willing to hire special collectors to run on the trains.

The enginemen's grievance is that they are accused of being untrustworthy. But it is the universal testimony of superintendents that old runners, with the best of characters and records, make some of the worst errors. Even the individual engineman who feels sure of himself must admit the evidence of the records as regards runners as a class, including the

best; and therefore he must recognize the propriety of a general monitorship; and of course he cannot ask to have his own case made an exception, any more than the honest cashier can object to having his cash counted by the "surprise auditor." If these Californians have, as a motive for their present attitude, some reason which they do not disclose, they may as well confess it, for nobody will seriously consider the arguments that have now been presented.

The foregoing paragraphs are not, of course, intended as a defense of what the Southern Pacific has done. Last January, after the Westfield disaster, a third man in the cab was suggested as the universal remedy for collisions, but the prevailing opinion appeared to be that to the third man it would sooner or later be necessary to add a fourth; that mere duplication of watchers was not the best remedy for forgetfulness on a locomotive. It is true that an experienced conductor, going on an engine, would be quite different from the kind of "third man" which every one has in mind when this alleged safeguard is talked about. The conductor would really bring to the engine a second independent mind. He would no longer neglect to confer with the engineman simply because he was too far away to do it conveniently. But would not the engine-riding habit have the same deadening effect on a conductor's mental activities that it is supposed to have on the mere monitor?

Moreover, the most rational remedy for collisions is the block system. The block system is the only adequate preventive of rear collisions, for collisions of that class are not usually due to the neglect of conductors and enginemen to confer with one another, and will not be cured by the new Southern Pacific rule. Every railroad manager wants the most effective measures possible to prevent these collisions, and therefore is looking to the use of the block system, if he has not already adopted it; and the men and facilities provided for this safeguard are (on single track) available for the prevention of butting collisions also. The need of measures to prevent butting collisions, simply adds to the incentive to adopt the space interval on all lines, both double and single. While, therefore, the conductors of the Southern Pacific have no excuse for rebelling against the action taken by the company to aid them in properly performing their duties, and every one of them is bound to do his utmost to make his work perfect 365 days in the year, we do not say that the company is absolved from the duty of providing at all times the best system of train-regulation, as well as the best-qualified force of conductors and enginemen.

The World's Railroads.

The tables of the railroad mileage in all the different countries of the world published in the last number of the *Archiv für Eisenbahnwesen* show that in the first year of the 20th century the aggregate length of the railroads of the world for the first time exceeded half a million of miles. It was a year of larger construction than in any other since this country's great feats in that direction between 1879 and 1887. The yearly additions to the world's mileage have been:

1896.	1897.	1898.	1899.	1900.	1901.
9,796	10,747	10,864	13,530	10,798	16,947

Europe, Asia and Africa all built more railroad in 1901 than in 1900; America a little less. In comparison with previous years, Asia has made unprecedented additions, building a little more than Europe even in 1901, though the figures published somewhat exaggerate this, some of the mileage in Siberia and Manchuria credited to 1901 having had the track laid before, though not formally opened (as part of it is not yet).

The mileage of the railroads in operation at the end of 1901 on the different continents was:

Europe	180,708	North America	226,503
Asia	41,814	South America	28,654
Africa	14,187	Australia	15,649
Old World	236,709	New continents..	270,806

—giving a grand total of 507,515 miles, against 490,568 at the close of 1900. In the above table the West Indies are included with South America. They are together credited with 1,791 miles.

North America, it will be seen, has more railroad than Europe and Asia together; the two Americas, more than all the rest of the world. For the four years ending with 1899 Europe built more railroad than America, which had not happened before for a long time, but in the two following years America has again built more than Europe.

As we have noted before in reviewing these statistics, the most notable fact of recent years has been the amount of railroad construction in Asia and Africa. The mileage opened as yet on those continents is trifling in comparison to their area and population, but it is a beginning, and especially in Asia seems likely to be continued at an increased rate. There and in European Russia are the two great fields promising immediate returns for the improved transportation. Asia at the end of 1895 had but 27,960 miles of railroad, so that in six years it has had an increase of 50 per cent. This has been due to British India more than to Russia, though the long lines of the latter country are more in the world's eye. British India had 25,373 miles at the end of 1901, Russia in Asia, including the Chinese Eastern, only 7,323—but as India has 40 times the population of Asiatic Russia, this is what should be expected. Even the increase in mileage in the past four years has been greater in India than in Asiatic Russia. Russia, however, in that time has built 70 per cent. more railroad in Europe than in Asia and has great need of more in Europe, while its Asiatic territory is yet to be developed.

Of European countries, the German Empire leads in mileage—with 32,753 miles; but it is followed closely by Russia, with 31,945, and the latter will doubtless soon take the lead, for it has 3,658 inhabitants and 6.8 square miles of area per mile of railroad, while the German Empire has but 6.4 square miles of area, and 1,712 inhabitants per railroad mile.

Great Britain makes but a modest show in the list under its own name, having but 22,100 miles in Europe; but it has more railroad in India than in Europe, has two-thirds of the railroads in Africa, and with those of its colonies in America and Australia counts up an aggregate of 91,845 miles, which is more than twice as much as any other nation can claim, except the United States, which with its 197,237 miles in the middle of 1901, which must have been as much as 200,000 by the end of that year, may be considered *hors concours*. It has so many, in fact, that the burden of supporting a mile of railroad falls on about 390 people here, while it is divided among 2,205 in Europe, 1,884 in Great Britain and Ireland, 1,425 in France, 1,712 in the German Empire, 2,012 in Austria-Hungary, 1,666 in Belgium, and 3,285 in Italy. And besides this we are burdened by the support of street railroads, which are still more numerous in proportion to population than in any other country. If any one should hint that we get more than they cost us out of these seemingly superabundant means of transportation, we shall not dispute him. In some way we have contrived to produce an extraordinary amount of this world's goods, and we suspect that our railroads have helped more than they have hindered—that, in fact, the rapid development and utilization of the resources of this new country have been made possible only by our vast net-work of railroads. They have come before their time, doubtless, sometimes; but the development of natural resources for the most part is impossible without them, and we see that Canada has but 294 inhabitants per mile of railroad, and Australia but 316.

The *Archiv für Eisenbahnwesen* has recently begun to publish tables of capital invested in railroads in the several countries of the world. These are more incomplete than the tables of mileage, but are good so far as they go. For Europe they are substantially complete, and show an aggregate investment in railroads of $20,246,000,000, and $123,259, per mile, ranging from $252,707 in Great Britain, to $143,792 on the Belgian State Railroads, $120,697 in France, $107,107 in Austria-Hungary, $98,244 in the German Empire, and $67,088 in Russia, down to $41,636 on the Swedish State Railroads, $37,743 in Norway and $21,251 on the State Railroads of Finland.

The capital statistics for other parts of the world cover about four-fifths of the mileage, and for this the total is $15,490,000,000, and $56,254 per mile, which is 45 per cent. of the average in Europe. In this latter statement, the capital of the railroads in this country is swelled $2,205,500,000 by including the stocks and bonds owned by the railroad companies themselves, which is nearly one-fifth of the total. If the capital of the railroads not reporting is in the same proportion as that of those which do, the total capital invested in railroads in the world is about $36,850,000,000, which is a tidy sum to be invested within 75 years—enough to carry on about ten bad wars.

According to the *American Lumberman* the railroads in Michigan are collecting demurrage from consignees on the monthly average plan, and a copy of the form of agreement prepared by the Michigan Car Service Association is printed. Two days' free time is allowed for unloading ordinary commodities, but the allowance is three days on coal and lumber under certain conditions. Debits and credits are settled at the end of each month. For example, if a car of coal is unloaded the same day it arrives the consignee will be allowed credit for two days, and this can offset two days' demurrage at any time within that month. On any car held over 10 days there will be a charge of $2 a day after the 10th day, notwithstanding the agreement. Contracts are made with the Michigan Car Service Association, but the average for each road is to be computed independently of all other roads. The *American Lumberman* naïvely suggests that, to be truly satisfactory, the debits and credits ought to be balanced only once a year, and that a consignee ought to be able, in dealing with the railroads delivering to him, to treat the whole of them as a single unit. In other words, the lumber dealers will be measurably satisfied if their demurrage bills, like Mark Twain's income tax, can be wholly balanced by "allowances." We do not know to what extent this mollifying contract has been adopted in Michigan or elsewhere, but if it is used for more than one year and produces good results the news will be worthy of notice, for most demurrage managers who have tried the scheme seem to think that it is sure to take the life out of all demurrage rules. The only railroad officer who can approve it, they say, is the soliciting freight agent, who, in his unbounded generosity, is always ready to give to both shippers and consignees whatever they may want, even to the half of his kingdom.

The Texas State Lumbermen's Association is not, perhaps, any more exacting in its demands upon the railroads than are shippers of other commodities or in other States; but it certainly takes a comprehensive grasp of the situation, as is evidenced by the following statement of its wishes: A guarantee that shipments shall be moved at a specified average speed per day, be not sidetracked nor held for any indefinite length of time when other freight is being handled; that a rebate be paid for cars unloaded sooner than the time limit required, and that cars be furnished promptly on requisition. As the proposed improvements are all desirable the managers of the Texas railroads will, no doubt, put forth their best energies for the purpose of carrying them out; though the penalty part of the programme will be impracticable. But in view of the improbability of complete success in this direction why do not the lumber men ask for something else? They seem to have forgotten all about annual passes for themselves, their wives and their salesmen; six months' credit on freight bills; the privilege of distributing a single car load (carried at the carload rate) among half a dozen different retail dealers; the provision at every station of cars 75 ft. long for long timber; fifth-class rate on shavings weighing three pounds to the barrel, and other little incidentals. Such modesty must be a result of the depressing atmosphere of the vacation season.

NEW PUBLICATIONS.

The Car Builders' Dictionary. 1903 Edition. New York: Published under the direction of the Master Car Builders' Association by *The Railroad Gazette*. Price, $5.

This dictionary, which has long been a standard reference book for all those who are in any way connected with or interested in the rolling equipment of railroads, has been re-written, re-engraved and brought up to date in every respect. The new edition contains 525 pages and 4,971 illustrations of cars and parts of cars, showing practically every standard type of freight and passenger cars, and the details of their construction. In general arrangement the lines of the 1895 edition have been closely followed, the book being divided into two general parts, the first 151 pages containing definitions, historical matter and specifications, and the last 374 pages containing the illustrations. The definitions are given in clear and concise language. Wherever possible references are given to the illustrations in the second section of the book, thus giving a complete alphabetical index to all the engravings as well as defining the terms and parts. In the illustrated pages are shown besides the numerous types of cars and their details, trucks and truck details, car furnishings, electric cars and trucks, together with the electrical machinery placed on them, the standards and recommended practice of the Master Car Builders' Association and car shop machinery. The subject matter in each of these divisions has been grouped together and again arranged under sub-headings in alphabetical order. With this arrangement the finding of the illustration of any part becomes a simple matter.

The aim has been to show present approved practice only, nothing that is experimental and nothing that is going out of use. Particular attention has been paid to steel cars, and the illustrations show the latest types in great variety. Draft gears and brake apparatus have been particularly well illustrated with a large number of examples of the designs most used. Practically every detail of car furnishings is shown in a wide variety of designs, and this portion of the book is a most valuable one. Electric cars have not been treated at great length, because to do this one field justice another work as comprehensive as this, and devoted exclusively to them, would be necessary, but enough types are shown to represent the present state of their design. Electric trucks and motors are grouped separately with the car bodies. One new subject has been added, that of car shop machinery. This deals with the machinery most commonly found in car shops and includes illustrations of wood working machines, forging machines and pneumatic tools, now so largely used in steel car repairs. The standards and recommended practice of the M. C. B. Association have been shown in full, arranged in the order given in the proceedings of the association. Particular attention has been paid toward making the book of great value as a guide for designing, specifying and ordering. In almost every case the maker's name and oftentimes the designating name or number of the part has been placed under the title to the engraving. The book is handsomely bound in leather and the engravings are uniformly excellent.

American Street Railway Investments. 1903. 305 pages, 9½ x 13 in. 32 maps. The McGraw Publishing Co., 114 Liberty street, New York. Price $5.

The tenth annual volume, just issued, contains reports of 1,361 companies, showing in detail the physical and financial condition of the properties. The figures include both operating and leased lines, and include data of all

new electric roads. A slight change in arrangement has been made in the volume at hand, and the reports of the companies are located by States, instead of alphabetically by towns, as heretofore. Gross receipts of all companies earning $25,000 or more are given in tabular form, in comparison with the figures for the previous year. The Interurban Co., of New York, heads the column, with gross earnings of $15,098,776, followed by the Union Traction Co., of Philadelphia, with $14,118,158; the Brooklyn Rapid Transit Co., with $12,788,168, and the Boston Elevated, with $11,321,030. The Manhattan Elevated stands fifth in the list. The volume seems complete in all respects, and is useful for purposes of reference.

TECHNICAL.

Manufacturing and Business.

McCord journal boxes have been specified on 1,500 cars being built for the Wabash by the American Car & Foundry Co.

N. A. Christensen, Milwaukee, Wis., has sold a 1,000-ft. air compressor to the Chicago, Milwaukee & St. Paul for its Minneapolis shops.

A. J. Schevers, formerly with McConway & Torley Co., Chicago, has associated himself with the Chicago Railway Equipment Co., with office at 204 Great Northern Building, Chicago.

During the past week the Pencoyd Works of the American Bridge Co. produced the largest tonnage in the history of the plant, turning out about 8,300 tons of structural steel and bridge work.

The Burlington & Missouri River (Burlington System) has just purchased ten of the new Remington "waybilling special" typewriters, which are to be used for waybilling in the freight offices of the company at Omaha, Lincoln and Denver.

W. P. Crockett, Chicago, Vice-President of the St. Paul Railway Supply Mfg. Co., has been appointed Chicago representative of the Northern Metallic Packing Co., of St. Paul, and will handle Northern metallic packing and the Curran locomotive chime whistle.

The firm of Elliot & Loomis (National Paint Works), Williamsport, Pa., was dissolved May 6th, at which time W. G. Loomis disposed of his interest to F. P. Cheesman. Mr. Elliot continues as manager of the works, and Mr. Cheesman will have charge of the sales department.

The Westinghouse Traction Brake Company, 26 Cortlandt street, New York, has received from the St. Louis Transit Co., St. Louis, an order for from 1,500 to 2,000 air-brake equipments for street railroad cars. This is said to be the largest single order ever given for air-brakes for electric cars.

The Buffalo Steam Pump Co., with works at North Tonawanda, has been purchased by William F. Wendt and Henry W. Wendt, owners of the Buffalo Forge Co. and the Geo. L. Squier Manufacturing Co. The North Tonawanda works will be continued, and the main offices will be at Buffalo, N. Y.

The American Trackbarrow Co., Lowell, Mass., has lately shipped to South Africa a carload of American trackbarrows. They are to be used by the Government railroads of that country. The concern has also sent a number of shipments to railroads in Europe, Australia and India. The company reports a steadily increasing American business.

The company formerly known as the National Railway Specialty Co., Chicago, will hereafter be known as the Camel Company. It will continue to make and sell the Security car door, Dunham car door, Q. & C. car door, N. R. S. hose bands, and the Camel journal bearing, formerly the National adjustable journal bearing. The offices are in the Old Colony Building.

The S. Obermayer Co. reports shipments from the Larimer plant during May of 250 carloads, averaging 20 tons each. Shipments from the Chicago plant were 80 carloads during the month, and from the Cincinnati plant, 110 carloads, making the total from the three plants 440 full carloads of foundry facings and blackings.

The Westinghouse Machine Co., through Westinghouse, Church, Kerr & Co., has within the short period of five years, since it took up the manufacture of large Corliss engines, sold a total of over 160,000 h.p., comprising four distinct types: vertical three-cylinder compound, vertical cross compound, horizontal cross compound and horizontal tandem compound. The equipments now in service include such plants as the New York Edison, Brooklyn Edison, Third Avenue Railroad and the Boston Elevated Railroad.

Westinghouse, Church, Kerr & Co. have recently sold train lighting equipments to the Chicago, Milwaukee & St. Paul and the Northern Pacific, for use on limited trains. The outfit consists of a 30 h.p. Westinghouse standard vertical single acting engine, direct connected to a direct current generator of corresponding capacity. The apparatus is put in the front end of the baggage car, where it is supplied with high pressure steam directly from the locomotive boiler through flexible piping. This system is now in use on the Chicago & North Western, the Union Pacific, the Lake Shore & Michigan Southern, and the Duluth, South Shore & Atlantic.

The Philadelphia Pneumatic Tool Co., to take care of its increased business in the middle west, has employed J. F. Ahern, formerly with the Scully Steel & Iron Co., to assist A. G. Hollingshead, Western Sales Manager for the Philadelphia Co. The company has also appointed H. B. Griner, late Assistant Manager of the Chicago Pneumatic Tool Co., to a position in the main office of the Philadelphia Pneumatic Tool Co. Large orders for chipping hammers, riveters and drills are reported from the Craig Shipbuilding Co., Toledo; from the Willamette Iron & Steel Co., Portland, Oregon; the Kewanee Boiler Works, United Gas Improvement Co., J. D. Connell Iron Works, New Orleans; Chandler & Taylor Co., Allis-Chalmers Co., and others.

Iron and Steel.

The Eastern Steel Co., Pottsville, Pa., recently organized, has increased its capital from $1,000,000 to $1,900,000.

The Oregonia Bridge Co. has been incorporated at Wilmington, Del., with $50,000 capital, by Harry W. Davis, L. L. Shockley and William L. Missimer.

The Central Illinois Construction Co. has been incorporated with $100,000 capital, to build railroads, bridges and tramways, by Chas. N. King and W. M. Greene, of Jersey City, N. J., and Howard M. Carter, of Evanston, Ill.

De Coursey May, General Manager of the New York Shipbuilding Company's plant at Camden, N. J., has been elected President of the company, to succeed Henry G. Morse, who died in New York on June 2. Charles L. Hall, formerly Purchasing Agent, has been appointed to succeed Mr. May.

Care of Boilers.

The length of time a boiler can be kept in service depends greatly upon the way it is kept washed out. It is just as important that a boiler be kept clean as it is that it be designed right, and in cases where both of these principles are carried out the cost of maintenance will be less than where they are neglected.—*From a report to the Master Boiler Makers' Convention.*

New Boats for the Fall River Line.

The fleet of the Fall River Line will soon be increased by two new steamers now building at the Fore River shipyard near Boston. One of these will be a magnificent side wheel passenger steamer 397 ft. long, 50 ft. wide, and 88 ft. over the guards. The wheels are to be 30 ft. in diameter, each having 12 buckets 4 ft. wide and 13 ft. long. The boat will be a little smaller than the "Priscilla," which has a displacement of 5,292 tons and accommodations for 1,500 passengers, but it will have finer lines and greater speed.

Autumn Meeting of the Iron and Steel Institute.

The autumn meeting of the Iron and Steel Institute will be held at Barrow-in-Furness, England, on Sept. 1, 2, 3 and 4, 1903. The programme includes visits to the Barrow Hematite Steel Co., Ltd., and the British Chilled Iron & Steel Co.; to the shipbuilding yards of Messrs. Vickers Sons & Maxim, Ltd.; to the works and docks of the Furness Railway, and to the iron ore mines at Hodbarrow, Messrs. Kennedy Brothers' mines, and the works of the Millom & Askam Iron Co. The Duke of Devonshire is president of the local reception committee, and Colonel Vickers is vice-president.

Artificial Granite.

The Engineering Company of America has under investigation a granitic stone which, it is claimed, has all the valuable characteristics of the natural granite. The stone is made of clay crystallized by artificial means, under heat and pressure, at a cost a trifle above that of making firebricks or terra-cotta. In making the granite, the clay which contains the various substances going to make up that rock, with the admixture of chemicals, is heated to a high degree, and crystallization takes place, giving, instead of the clay, a close and hard granite. Tests for crushing stone made at the New York University show that this material stands a pressure from 19,000 to 29,500 lbs. per sq. in. This granite is absolutely free from the disintegrating elements contained in the natural stone. It has not the vegetative flaws or parasitic organisms that cause a natural stone to decay, or to crack, when subjected to a high temperature. It is fire-proof, impervious to water and steam, and resists a high electric current. These stones are made in any color, form or design, and can be highly polished. The Manhattan Railway has made use of it for the third-rail insulating blocks, and it can be used also for railroad ties, for flooring, sidewalks and pavement. In connection with paving, it is valuable, as any desired form of grooving or corrugation can be imparted to it in the press, so that the surface of the street, while smooth, will be such that horses will not slip.

Recent Orders for Nickel-Steel.

Since the editorial discussion in the *Railroad Gazette* February 6, of the probable value and use of nickel-steel rails, orders have been placed by the New York Central for nickel-steel rails for use on the curve of the West Albany hill; by the Bessemer & Lake Erie and by the Union Railroad at Pittsburg. The New York Central and Bessemer & Lake Erie rails are about to be laid. Thorough tests will be made on these roads. Based on results obtained from tests of nickel-steel cannon, the United States Navy Department recently let contracts for 12 sets of forgings of nickel-steel for 7-in. guns to the Benjamin Atha Works of the Crucible Steel Company of America; 10 sets of nickel-steel forgings for 8-in. guns to the Midvale Steel Co.; and 10 sets of nickel-steel forgings for 8-in. guns to the Bethlehem Steel Company. On June 2 the Navy Department let additional contracts to the Midvale Steel Company for 24 sets of nickel-steel forgings for 8-in. guns, and 36 sets of nickel-steel forgings for 7-in. guns to the Bethlehem Steel Company, making a total of 92 sets of nickel-steel forgings awarded by the Navy Department in the past few months. The last award of 60 sets is for the new 16,000-ton battleships "Vermont," "Minnesota" and "Kansas." Among the many things for which nickel-steel is used are the blooming mill rolls in large steel mills. A number of these rolls are used at the works of the Jones & Laughlin Steel Co., and the Bethlehem and the Carnegie Steel Companies.

Electric Railroad Accidents in Berlin.

The *Zeitschrift für Kleinbahnen* for May, 1903, contains some interesting tables regarding accidents on the electric street railroads of Berlin during the past few years. The figures are compiled with characteristic German thoroughness. The number of serious and fatal accidents—the former including the latter—during the years 1900-'02 were as follows:

Year.	Serious.	Fatal.
1900	332	40
1901	217	29
1902	189	28

The decrease of accidents is still more striking if the growing traffic is taken into account. The accidents per million car-miles being:

Year.	Serious.	Fatal.
1900	2.95	.35
1901	1.65	.22
1902	1.34	.20

This decline in the number of accidents is ascribed to the greater skill of the motormen, to improvements in the brakes, to the stricter enforcement of the maximum speed regulations, and to a large degree to the growing familiarity of the public with electric street traffic.

An analysis of the minor, serious, and fatal accidents in 1902 with regard to the assigned cause gives the following results:

Cause.	Minor.	Serious.	Fatal.	Total.
Getting on car while in motion.	268	26	1	295
Getting off car while in motion.	447	31	1	479
Falling from car	46	1	..	47
Knocked down or run over	290	66	23	379
Collision of cars	248	21	2	271
Miscellaneous	258	16	1	275
Total	1,557	161	28	1,746

A comparison of street railroad accidents with those connected with other forms of street traffic gives the following results for 1902:

Cause.	Minor.	Serious.	Fatal.	Total.
Street railroads	1,557	161	28	1,746
Trucks	560	235	32	827
Omnibusses	83	24	5	112
Cabs	353	60	3	416
Private carriages	66	27	3	96
Fire engines and postal wagons	30	14	1	45
Perambulators, handcarts and dog wagons	51	2	..	53
Bicycles	309	48	2	359
Miscellaneous	68	19	2	89
Total	3,077	590	76	3,743

These figures indicate that the electric car has not a monopoly of street accidents but shares them with a large variety of other forms of locomotion, to which more than half the serious, fatal and total accidents are due. Trucks are much more dangerous to the residents of Berlin than electric cars are. Cabs, private carriages and even bicycles contribute their share to the accident column.

An Adirondack Hardwood Tie Experiment.

The New York Central & Hudson River Railroad Company, which buys 2,000,000 hard pine ties per annum for its tracks, and gets them from the South, is now setting on foot experiments with the purpose of discovering whether under some treatment the beech, maple, and birch of the Adirondacks cannot be made to take the place of the southern hard pine, which is growing scarce and expensive.

The company has asked the Bureau of Forestry of the Department of Agriculture to conduct for it during the summer critical tests in this matter. The experiments will be begun by the purchase by the railroad each month of 2,000 native hardwood ties, which, after seasoning and treatment, will be laid in the company's tracks. Dr. Hermann Von Schrenk will be in charge, under the direction of the Bureau of Forestry, and the experiments may lead to the ultimate entire substitution of the Adirondack woods for the southern. If the experiments are successful, the company will enter into contracts with Adirondack lumbermen for what they need, but only such trees will be taken as will yield two ties from the butt log—an arrangement which will leave all but the largest trees standing and remove only those which have reached or are past their prime—thus insuring an ample supply for the future and preserving and benefiting the forest. It is pointed out, also, that the cutting of the larger beech, birch, and maple trees will give more room for the growth of the more valuable space, now crowded out by the others.

As to the success of the experiment, the problem resolves itself into finding a process of preservation sufficiently cheap. Already abroad in France crossties impregnated with tar oils are used, and last as many as 30 years, but this process is very expensive and would not at the present time justify, from the railroad's standpoint of business, the change from the hard pine. The method to be tried by the New York Central is one of impregnation with salts.

Another company which is seeking a means of making

a cheaper timber available is the American Telegraph and Telephone Company, which designs to give cedar and chestnut pole some treatment which will prolong the life of the wood.

The bearing of these experiments on the general question of scientific forestry is obvious, for the plan of the New York Central Railroad not only seeks to preserve for finer uses a dwindling supply, but contemplates in the use of the new supply a scientific and economic system very different from the methods usually followed by the people all over the country who make a business of furnishing crossties to the adjacent railroads.

THE SCRAP HEAP.

Notes.

The Texas & Pacific is to have a telephone line throughout the length of its railroad.

At Indianapolis, June 8, two ticket brokers' clerks and an employee of a railroad company were arrested for fraudulent ticket scalping.

The Pennsylvania Railroad has applied for space at the St. Louis Exposition, and an exhibit will be made, which will be in charge of Theodore N. Ely, Chief of Motive Power.

Western newspapers say that the Chicago & North Western will curtail or abolish Sunday excursion business and that the Chicago, St. Paul, Minneapolis & Omaha has entirely abandoned this branch of traffic.

In a butting collision between a passenger train of the Atchison, Topeka & Santa Fe and a freight of the Missouri Pacific near Stilwell, Kan., on June 4, nine persons were killed and 28 injured. The Atchison train was running on the Missouri Pacific track in consequence of the blockading of its own line by a flood, and it is said that the pilot misread a meeting order.

The steamships running on the new fortnightly service of the New York, New Haven & Hartford, from Boston to Liverpool, and Manchester, have been well filled, ever since the line was opened in January, and the outgoing vessels would have been entirely filled except for western freight congestion. Noteworthy features of the import traffic have been the receipts of pig iron, steel billets, and of 200 carloads of steel rails.

The workmen in nearly or quite all of the freight houses in Chicago had their pay raised last week about 5 per cent. According to the press despatches a united appeal or demand was made by the men; and after one road, the Lake Shore & Michigan Southern, had signed an agreement with the men, to run for one year, the other roads signed similar agreements. Just who is the other party to these agreements does not very clearly appear.

On the Pennsylvania Lines West of Pittsburgh the principal station restaurants are to be conducted by the railroad company, the management of the road having decided that uniformity in the quality of the service and methods of management, as well as in prices, is of more importance than profit. As the leases of the present managers of the restaurants expire the company will take the management into its own hands. The first stations to be dealt with will be those at Alliance, Crestline and Fort Wayne. The station restaurants will be managed by the dining car department and will be maintained at the high standard which characterizes the service on the cars. On the Pennsylvania Lines East of Pittsburgh the company has for several years managed a number of the most important station restaurants. The list now includes, we believe, those at Pittsburg, Washington, Baltimore, Philadelphia and Jersey City. The last named, with which we happen to be acquainted, is a model.

Coal Rates, Expenses and Earnings on the Reading.

George F. Baer, President of the Philadelphia & Reading, testifying before the Interstate Commerce Commission in New York June 10, said, among other things, that the rate for hauling coal from the mines to tidewater was $1.55 a ton. Asked by Commissioner Prouty if he thought that was a fair rate he said "I certainly do."

Q. Why do you think it is a fair rate? A. Because my experience, extending over a period of 30 or 40 years, has led me to believe that it is reasonable. It has been determined by the nature of the commodity and by the natural ability of the community to pay that rate as a part of the cost of the coal.

Q. Why is it that you charge so much more for the transportation of anthracite coal than for any other merchandise? A. The manufacturers along the line of our road have to compete with manufacturers in the West, and if we did not make low rates for our manufacturers they could not get on. Coal trains must be frequently sidetracked to get out of the way of passenger trains, so coal carrying is very expensive for us.

Q. Suppose the rate was reduced 25 cents a ton, what would be the result? A. We would lose $2,750,000 a year.

In the Reading reports there was the item of a new bridge. The Commissioner thought that this bridge should be capitalized. Mr. Baer did not.

Mr. Prouty.—Why shouldn't it be? A. Because if we capitalize every such improvement it would bankrupt us. We not only couldn't pay dividends, but we couldn't pay interest. We would be in the position of some of the English railroads, which have tried that plan, and which are now in a very bad way. Every time a railroad in this country has tried that, ruin has followed, and ruin always will follow.

Commissioner Prouty suggested that if the Reading Railroad reduced the freight rates on coal the Reading Coal Company, which the railroad owns, would make more money.

"If you guarantee," answered Mr. Baer, "that a reduction in the carrying rate will not reduce the price of coal and so ruin the coal company as well as the railroad company, there would be merit in your suggestion. But you make no such guarantee. At any rate, the great State of Pennsylvania is not going to allow her great corporations and her coal fields to be spoliated for the benefit of the rest of the United States."

J. S. Harris, former President of the Reading, testified that between 1896 and 1901 the coal carrying roads entered into an agreement by which a certain percentage of the coal traffic was assigned to each road, but none of the roads kept the agreement.

Anthracite Coal Rate Hearing.

On Monday of this week the Interstate Commerce Commission, sitting at New York City, resumed its inquiry into the rates on anthracite coal from the Pennsylvania mines to New York harbor. Robert M. Olyphant, late President of the Delaware & Hudson, and George F. Baer, President of the Philadelphia & Reading, were examined. The decision of the United States Court on the application of the Commission for an order to compel railroad officers to show certain contracts, has not at this writing been given, but it appears that one contract of the kind which the Commission is looking after was produced on Monday voluntarily. This is one between the New York, Susquehanna & Western Coal & Iron Co. and J. & J. J. Jermyn, of Scranton. It is the conduct of business under contracts of this kind which is alleged by the complainant in this case to constitute an illegal restraint of trade. The substance of the principal sections of the N. Y., S. & W. contract is as follows:

That the sellers should sell all of their coal, from collieries specified, to the buyers.

That shipments should be made from time to time as called for by the buyer, the buyer to give on the 25th of each month notice of the quantity wanted for the next month in as nearly equal daily and weekly quantities as the requirements of the trade permitted.

That the buyer should use the best efforts to find a market for the coal of the sellers and should give a market so as to enable the sellers to work their collieries as many days a year as the other collieries similarly situated.

That the buyer should not discriminate in favor of its own collieries, or in favor of any firms or persons with which it had contracts to buy coal, but that the quantity ordered monthly should be a just proportion of all the coal agreed to be purchased by the buyer, measured by the colliery capacity of the respective sellers.

That the colliery capacity should be determined on Jan. 1 of each year by representatives of the parties, and in case of dispute, should be referred to the President of the Girard Trust Company for settlement.

That prices should be as follows: On all sizes above pea coal, 65 per cent. of the general average price, free on board at tide. On pea coal, 50 per cent. of the general average price, free on board, at tide, when that is below $2.50 a ton, and for each advance of 10 cents a ton above $2.50, 1 per cent. increase until the price reaches 65 per cent. of the general average price. On buckwheat No. 1, similarly, 40 per cent. of the general average price, free on board, up to $2, and for every 10 cents over that figure an increase of 2 per cent. until the free on board price reaches $2.50. On all smaller sizes, 25 cents a ton, free on board railroad cars at the breaker, and for every 10 cents advance above $1.30 a ton an increase of 5 cents a ton.

That the general average prices, free on board, are to be determined by an expert to whom the buyer shall furnish not later than the 8th of each month a statement of the quantity of each size sold the preceding month, together with the amount realized at tide on all sales of each size bought in the Lackawanna region, this information to be confidential.

That the percentage of various sizes of coal to be delivered under the contract should be the same as the average produced at the several collieries operated by the buyer in the same region.

The International Railway Congress.

Mr. W. F. Allen, Secretary of the American Railway Association, will sail for Europe on June 18 to attend a meeting of the International Commission of the Railway Congress at Brussels. The organization of the Congress which is to meet in Washington, D. C., in May, 1905, will be the principal subject for discussion.

The Söul-Fusan Railroad.

The Japanese did not take a real, live interest in the Söul-Fusan railroad until reports had reached Tokyo to the effect that Russia was massing troops on the Korean border and that there would probably be a big row in the "Land of the Morning Calm." Then the subscription list was suddenly filled; 58,477 shares had been taken up on the morning of Monday, May 11, and by the afternoon of the same day about 100,000 had been taken up and the list was closed.

High Water at St. Louis.

A disastrous flood occurred at St. Louis on June 6, following the high water in the Missouri and upper Mississippi valleys. Levees were carried away for miles along the banks of the Mississippi, and the country for many miles around St. Louis was submerged. In East St. Louis, Madison, Granite City and Venice great damage was done. Twenty lives were reported lost in and near St. Louis. The Mississippi reached its highest point on Monday, when the stage at St. Louis was 37.5 ft. above low water mark. The approaches to both bridges were damaged and all railroad traffic was greatly delayed, but since the water has receded, temporary repairs have enabled most of the lines to run trains and carry some freight.

Floods in South Carolina.

A cloudburst near Spartanburg, S. C., on June 6 flooded the Pacolet Valley, causing the death of 58 persons, and resulting in extensive damage to property. Half a dozen counties were directly affected, but the greatest loss occurred at Spartanburg and Clifton. Many railroad bridges in the valley were swept away and tracks were badly damaged, so that for a time all traffic was suspended throughout most of the northern part of the State. Five lines enter Spartanburg, including three branches of the Southern, the Glenn Springs, and the Charleston & Western Carolina. Bridges of the Southern Railway are reported destroyed over Broad, North Tyger, Middle Tyger, Seneca and Pacolet rivers. The Congaree river also overflowed its banks, doing considerable damage in the vicinity of Columbia.

The Kansas Floods.

The high water in the Missouri River has receded and the work of clearing up the regions lately submerged is progressing rapidly. Telegraph communication has been restored, and business is being pretty generally resumed. The railroads are making temporary repairs to bridges and tracks, and the main lines are now passable. Although the reports of damage to railroads have been exaggerated, the value of freight destroyed added to the expense of replacing bridges and tracks will bring the total loss up into the millions. The greatest loss occurred at Kansas City, where the whole of the yards in the bottoms were under water. At the Union Station, the highest point in the flooded district, the water was still four feet above the main floors on June 4. Besides scores of freight cars whose contents were ruined, freight houses were flooded belonging to the St. Louis & San Francisco, the Chicago & Alton, the Burlington, the Santa Fé, the Rock Island, the Missouri Pacific, the Wabash, the Kansas City Southern, the St. Joseph & Grand Island, the Chicago Great Western, and the Union Pacific. It is reported that 16 important bridges were destroyed in Kansas City.

A Railroad Which May Cause a War.

The movements of Russia on the Korean frontier are exciting great uneasiness in Japan. The Japanese military attache at Söul wires home that the Prefect of Antung-hsien has notified the Korean authorities at Wiju that 2,000 Russian soldiers have arrived at Antung-hsien, and the local officials in Taitung-Kuang announce that Russian soldiers are also expected there shortly and that they have been told to get the town ready for their reception by cleaning the streets, roads and houses. At the same time it is announced that the Russians are beginning work on a branch line of the East Asiatic Railroad starting from Liaoyang near Mukden and intended to run via Fenghwang to a port on the Yalu opposite Wiju. They claim that they obtained a concession from China to build this line long ago; but it is very doubtful if Japan allows them, without fighting, which will enable them to throw as many men as they like into Korea at very short notice.

Responsibility for a Car Destroyed by a Cyclone.

The Arbitration Committee of the Master Car Builders' Association, sitting in a case at its April meeting which involved much conflicting testimony, rendered a decision based on grounds entirely outside of the evidence presented by either side. From the evidence presented by the Galveston, Harrisburg & San Antonio it would seem that on June 27, 1902, a train on its line near Bernard, Texas, was blown from the track by a cyclone and 22 cars damaged. Among these were three Erie box cars, one of which was totally destroyed. Affidavits of members of the wrecking crew stated that some of the cars were found in a cornfield 200 yds. from the track, and that the track was intact and in good shape after the accident. On July 8 the G., H. & S. A. asked authority to repair the two damaged cars at the Erie's expense, which was refused. The bill of the Erie for the value of the destroyed car was returned unpaid by the G., H. & S. A., as it claimed that the car was destroyed through no fault whatever on its part, but the two damaged cars were subsequently repaired and no bill rendered. The Erie claimed that the Weather Bureau report for June 27 showed nothing in the weather conditions that would cause such damage and that the accident must have been from some other cause. The bill for the destroyed car was presented to the Arbitration Committee with the evidence on both sides, and its decision was that the bill of the Erie should be paid. It was made on the grounds that the preface to the Rules for Interchange provides that railroad companies handling cars are responsible for damage done to any car by unfair usage, derailment or accident, and that damage caused by a wash-out, fire or tornado is covered by this provision.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

American Society for Testing Materials.

The sixth annual meeting will be held at Delaware Water Gap, Pa., July 1 to 3. Edgar Marburg, Secretary, University of Pennsylvania, Philadelphia, Pa.

Association of Traveling Freight Agents.

The National Association of Traveling Freight Agents met at Cincinnati, Ohio, June 4, and elected the following officers: President, T. F. Sweat, of Chicago; Secretary, John C. Wood, of Chicago.

Railway Surgeons.

The annual meeting of the International Association of Railway Surgeons will be held at the German House, Indianapolis, Ind., June 17-19. J. H. Ford, Chairman Committee on Arrangements.

Saratoga Conventions.

A special train, over the Lake Shore & Michigan Southern and the New York Central, will be run from Chicago to Saratoga, for the Master Mechanics' and Master Car Builders' conventions. Arrangements are in charge of B. A. Keeler, City Passenger Agent, Chicago. The schedule has been arranged as follows: Leave Chicago, June 22, 2 p.m.; Toledo, 7.55 p.m.; Cleveland, 10.35 p.m.; arrive Saratoga June 23, 1 p.m.

Accounting Officers.

The Association of American Railway Accounting Officers held its annual convention at Hot Springs, Va., May 27 and 28. Among the subjects that were discussed were the light weighing of cars, the definition of merchandise, way-billing small shipments, inter-road switching charges, a new way-bill form for use on typewriters, and settling switching reclaims. Mr. A. I. Culver, Third Vice-President of the Delaware & Hudson road, read a paper on "Administrative Accounting." The President of the Association is J. W. Renner, Pennsylvania Lines West of Pittsburgh, Pittsburg, Pa., and the Secretary is C. G. Phillips, 79 Dearborn Street, Chicago. The next meeting is to be at Saratoga, N. Y., June 29, 1904.

PERSONAL.

—Mr. F. J. Graves, Master Boiler Maker of the Chesapeake & Ohio at Huntington, W. Va., Past President of the International Railway Master Boiler Makers' Association, is a native of Kanawha County, West Virginia, born there on June 10, 1861. He began working for the C. & O. in 1879 in the boiler shop. Ten years later he was placed in charge of the company's boiler shop at Covington, Ky., where he remained till 1891, when he was transferred to Huntington to take charge of the boiler department of the main shops. He has held that position ever since. Mr. Graves is a practical mechanic of ability, and is also one of the ambitious kind who is in search of technical knowledge and practical information that will tend to raise the standard of boiler making. This habit of mind made him active in organizing the association of which he was the first president.

—Mr. F. D. Casanave's retirement from the office of General Superintendent of Motive Power of the Baltimore & Ohio gives occasion for recalling the valuable work which he began more than 20 years ago in adapting piece price systems to new work and to repair work in railroad shops. In much of this he was a pioneer, and it is probably due to his work that the results obtained in the shops of the Pennsylvania and the Pennsylvania Lines West have been so advantageous both to the company and to the men employed. It is commonly said and it is probably true that the best mechanics in the country are those now employed in those shops—drawn there by the rewards of industry and alertness afforded by the piece price system. In 1886 Mr. Casanave wrote a series of seven articles for the *Railroad Gazette* giving the results of his studies of this subject and his practical experience in applying its details, which are as true and exact now as they then were, and which should be read by any who are in doubt.

—Mr. R. A. McCandless, late chief clerk to the Superintendent of the Dakota Division of the Great Northern, has been promoted to the position of Assistant Superintendent of that division, with office at Larimore, N. Dak. Mr. McCandless was born at Wilton Junction, Iowa, in 1878, and his entire railroad service has been on the Great Northern. He started as a messenger in 1894.

—Mr. Herbert A. Jaggard, who on the first of this month was promoted to the position of General Agent at Pittsburg for the Pennsylvania Railroad, is 38 years old. Mr. Jaggard was born at Altoona, Pa., and was graduated from Yale in the class of '86 and also from the Rensselaer Polytechnic Institute (Civil Engineer) in 1889. In the latter year he entered the service of the Pennsylvania as a rodman. During the year 1892 he worked on a location corps in the Black Lick and Ebensburg coal districts. The following year he was appointed Assistant Supervisor at Downington, Pa., and in 1895 he was assigned to signal duty on the Philadelphia Division. Later he spent three months abroad studying railroad and transportation conditions, especially in London and Berlin. In August, 1896, he was made Assistant Supervisor at Paoli and in 1898 was transferred to Norristown, and about a year later was appointed Supervisor. In 1900 he became Special Agent in the office of the General Superintendent of Transportation, in charge of fast freight movement, from which position he now goes to Pittsburg.

—Mr. J. A. Doarnberger, Master Boiler Maker of the Norfolk & Western, was elected President of the International Railway Master Boiler Makers' Association, at its second annual convention at Columbus, Ohio, in May last. He was born in 1867, at Hagerstown, Md. When 16 years old he left the public school to learn the trade of boiler making. In 1888 he went to work in the shops of the Norfolk & Western at Roanoke, Va. After working a year with that company he was made assistant foreman of the boiler shop at that point, and in 1891 was promoted to Foreman of that department. In 1897 he resigned to accept a similar position with the Richmond Locomotive Works, which position he filled till 1900, when he resigned to take charge of the Lake Shore boiler shops at Cleveland, Ohio. In 1901 Mr. Doarnberger was given his former position with the Norfolk & Western at Roanoke.

—Mr. W. D. Taylor, M. Am. Soc. C. E., Professor of railway engineering in the University of Wisconsin, has been appointed engineering expert to the State Tax Commission of Wisconsin to assist the commission in the appraisement of the physical properties of the railroads of the State in preparation for the change, in accordance with the new law, from the revenue to the ad valorem basis of taxation. Mr. Taylor's new duties will not interfere with his work at the University.

—Mr. William W. Wheatly, who has become General Manager of the Street Railway department of the Public Service Corporation of New Jersey, is about 44 years old. Mr. Wheatly is a native of Princeton, Ky., and his railroad career dates from 1873, when he began as a clerk in the freight office of the Elizabethtown & Paducah. From 1875 to 1896 he served successively the Chesapeake, Ohio & Southwestern, the Chicago & North Western and the West Shore. In the last named year (1896) Mr. Wheatly resigned from the West Shore to become Division Superintendent of the Brooklyn Heights Railroad, and in 1899 he took charge of all the surface lines of the Brooklyn Rapid Transit Company, as Acting General Superintendent. The Public Service Corporation, with which Mr. Wheatly is now connected, was organized to operate the following street railroads in New Jersey: The New Jersey Street Railway, the Jersey City, Hoboken & Paterson Street Railway; the Elizabeth, Plainfield and Central Jersey Railway, the Orange & Passaic Valley Railway, and the South Jersey Gas, Electric & Traction Company. Mr. Wheatly was for some years Secretary of the New York Railroad Club.

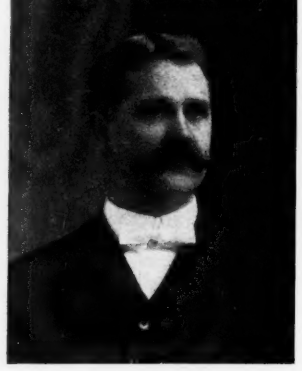
—Mr. William D. Ewing, for several years General Superintendent of the Fitchburg, died June 7, at the home of his son, in West Somerville, Mass. He was a native of Indiana, Pa., and was 57 years old. His first railroad experience was on the Illinois Central in 1868 as a freight brakeman. For a time he was on the Ohio & Mississippi. In 1881 he became Secretary and Treasurer of the Evansville & Terre Haute, and four years later he was General Superintendent of the same road and in 1886 General Manager. In 1891 he was appointed Assistant General Superintendent of the Fitchburg, and in November, 1893, assumed the General Superintendency.

—Mr. I. G. Rawn, the new General Superintendent of Transportation of the Illinois Central, was born at Delaware, Ohio, in 1858. Mr. Rawn commenced railroading with the old Bee Line road as a telegraph operator, later becoming trainmaster. In 1888 he went to the Kentucky Central as Master of Transportation, but resigned in 1889 to go to the Chesapeake & Ohio as Superintendent and Superintendent of Transportation. In January, the following year, he became General Superintendent of the Baltimore & Ohio Southwestern at Cincinnati, where he remained until December, 1902, when he went to Pittsburg as General Superintendent of the Baltimore & Ohio, which position he now resigns to go to the Illinois Central.

—Mr. G. H. Turner, who was General Manager of the Midland Railway of England for nine years, ending 1901, died on May 20. Mr. Turner entered the service of the Bristol & Exeter when only 12 years old and served in all the principal grades of the freight department. For a short time he was on the Glasgow & South Western as Goods Manager, but all the rest of his active life was on the Midland.

—Mr. John Woodman, formerly Division Engineer of the Western Division of the Canadian Pacific, has left the railroad engineering service to take up general engineering and architectural work, and has opened an office in the Merchants' Bank Block, Winnipeg, Man.

—Mr. Edwin P. Bates, who, on June 1, went from Pittsburg to Philadelphia as General Freight Agent of the Pennsylvania Railroad, was born in Allegheny County, Pa., in 1861, and was educated at Beaver College. He began his railroad service as a clerk for the Assistant General Freight Agent of the Pennsylvania Company in 1882. In 1884 he took a similar position in the General Freight Agent's office of the Allegheny Valley, and two years later became Chief Clerk. In November, 1887, he was appointed Special Agent, and in 1891 General Freight Agent of the same road, where he has remained until now, his title being changed to Division Freight Agent when the road became a part of the Pennsylvania.



—Mr. Isaac P. Jernigan, Auditor of the Old Dominion Steamship Company, died at his home in New York City, June 7. Mr. Jernigan was 51 years old and was well known in southern transportation circles, having been Auditor for the Norfolk & Southern at Norfolk, Va., for about 14 years.

—As we go to press, we learn that Mr. E. F. Grafstrom, Mechanical Engineer of the Atchison, Topeka & Santa Fe, was drowned in the Topeka flood. A gasoline launch with rescuing party capsized. Further particulars are not at present available.

ELECTIONS AND APPOINTMENTS.

Algoma Central & Hudson Bay.—E. Hacking has been appointed Master Car Builder, with headquarters at Sault Ste. Marie, Ont., succeeding W. Apps, resigned.

Burlington & Missouri River in Nebraska.—J. G. Taylor, Assistant Treasurer and Auditor, with office at Omaha, Neb., has resigned. C. J. Ernst succeeds Mr. Taylor as Assistant Treasurer and W. P. Durkee, hitherto Assistant Auditor, succeeds Mr. Taylor as Auditor.

Canadian Pacific.—The following announcements have been made in the service of the steamship company: D. W. Campbell has been appointed General Superintendent of the Atlantic steamship service, with office in Montreal. J. W. Troup has been appointed General Superintendent of the British Columbia coast service, with office at Victoria, B. C. Lincoln Smith has been appointed Superintendent of the upper lake service, with office at Owen Sound, and J. C. Gore is appointed Superintendent of the British Columbia lake and river service, with office at Nelson, B. C.

Central New England.—J. B. Gannon has been appointed Master Mechanic, with headquarters at Hartford, Conn., succeeding W. A. Brown, resigned.

Colorado & Wyoming.—The officers of this company are: J. A. Kebler, President; A. C. Cass, Vice-President; R. M. Waite, Assistant to President; S. I. Heyn, Secretary and Treasurer; A. D. Moss, Assistant Treasurer; D. C. Beaman, General Counsel; C. A. Parker, Traffic Manager; J. A. Writer, Auditor; S. G. Pierson, Pur-

chasing Agent; R. M. Hosea, Chief Engineer; John T. Kebler, General Superintendent of the Southern Division; all with offices at Denver, Colo. J. C. Cornell, Superintendent of the Southern Division, at Trinidad, Colo.; C. S. Robinson, General Superintendent of the Northern and Middle Divisions, at Pueblo, Colo.; F. R. Ahbe, Superintendent of the Northern Division, at Sunrise, Wyo., and Geo. Van Brimer, Superintendent of the Middle Division, at Minnequa, Colo.

Chicago, Rock Island & Pacific.—H. E. Byram has been appointed Assistant to First Vice-President C. H. Warren.

Dansville & Mt. Morris.—C. A. Ingel has been appointed Superintendent.

Delaware & Hudson.—H. G. Young, Second Vice-President and General Manager, has resigned, to take effect about July 1.

Denver, Enid & Gulf.—J. Overholt, heretofore Trainmaster, has been appointed General Superintendent, with headquarters at Enid, Okla. T. The positions of Trainmaster and Roadmaster have been abolished.

El Paso-Northeastern.—F. P. Barnes has been appointed Superintendent of Motive Power and Machinery, with headquarters at Alamogordo, N. Mex.

Erie.—The headquarters of S. P. Shane, Freight Traffic Manager; C. L. Thomas, General Freight Agent, and G. B. Whittlesey, Assistant General Freight Agent, are to be removed from Cleveland, Ohio, to Chicago, Ill. The change will take effect about June 15.

Fountain Head.—E. C. Coykendall has been appointed General Manager, with headquarters at Knoxville, Tenn., succeeding R. M. Doll, Jr., resigned.

Frankfort & Cincinnati.—D. W. Lindsey, Jr., heretofore General Freight and Passenger Agent, becomes Secretary and General Agent.

Grand Trunk.—G. B. Filgiano has been appointed Auditor of Passenger Accounts, with office at Montreal, Que., succeeding J. Payne, deceased.

Illinois Central.—C. F. Annett, Assistant Superintendent of Telegraph at Chicago, has resigned, and his territory has been divided. B. Weeks has been appointed Assistant Superintendent of Telegraph, with headquarters at Memphis, in charge of telegraph and telephone lines south of the Ohio River, and those north of the river will be under E. Parsons, Assistant Superintendent of Telegraph, with office at Chicago.

George W. Smith, heretofore Assistant Superintendent of Machinery, has been appointed Master Mechanic, with office at Chicago, Ill., succeeding F. E. Place.

Illinois Terminal.—T. C. Moorshead has been appointed Engineer of Maintenance of Way, with headquarters at Alton, Ill.

Kettle Valley Lines.—G. W. Fairweather has been appointed General Freight and Passenger Agent, with headquarters at Republic, Wash.

Mexican Great Eastern.—The headquarters of W. G. Seaver, Vice-President and General Manager, have been removed from Chicago, Ill., to Philadelphia, Pa.

New York, New Haven & Hartford.—G. H. Wilson has been appointed Acting Superintendent of the New York Division, with headquarters at New York City, succeeding O. M. Shepard, Superintendent.

H. E. Nettleton has been appointed Assistant Superintendent of the Shore Line Division, with headquarters at New London, Conn.

J. M. Tomlinson has been appointed Auditor of Freight Receipts, succeeding John Mackrille, resigned.

Northern Central.—W. G. Coughlin, heretofore Principal Assistant Engineer, with headquarters at Williamsport, Pa., has been appointed Division Superintendent, with headquarters at Elmira, N. Y., succeeding H. P. Lincoln, promoted.

See Pennsylvania.

Oregon Short Line.—See San Pedro, Los Angeles & Salt Lake.

Philadelphia, Baltimore & Washington.—James Buckelew, heretofore Assistant Engineer of the Pennsylvania at Pittsburg, Pa., has been appointed Principal Assistant Engineer of the P., B. & W., with headquarters at Wilmington, Del., succeeding A. Feldpauche, resigned.

Pennsylvania.—J. H. Gumbes has been appointed Assistant Engineer on the Monongahela Division, with office at Pittsburg, to succeed George W. Snyder, who has been appointed Assistant Engineer on the Pittsburg Division, succeeding James Buckelew. A. J. Whitney, Jr., has been appointed Assistant Engineer at Camden, N. J., of the West Jersey & Seashore, succeeding J. H. Nichol, promoted. J. C. Auten, Assistant Engineer, has been transferred to West Pennsylvania Division. A. B. Cuthbert, Assistant Engineer, transferred to Elmira and Canandaigua Division. J. W. Stone, Supervisor at Trenton, N. J., has been appointed Assistant Engineer Tyrone Division.

W. B. Ott has been appointed Assistant Master Mechanic at Harrisburg, Pa., succeeding N. Lynam, Jr., resigned.

(See also Philadelphia, Baltimore & Washington.)

St. Louis & North Arkansas.—G. L. Sands, Vice-President, has been appointed Manager, succeeding G. West.

San Pedro, Los Angeles & Salt Lake.—H. W. Henderson, heretofore Division Superintendent of the Oregon Short Line, has been appointed Superintendent of the Salt Lake Division of the S. P., L. A. & S. L.

Southern.—W. H. Gatchell has been appointed Inspector of Agencies, with office at Washington, D. C. His work will extend throughout all of the lines of the company.

West Jersey & Sea Shore.—See Pennsylvania.

LOCOMOTIVE BUILDING.

The Bush Co., Ltd., is having one locomotive built at the Baldwin Works.

The Seaboard Air Line is having 10 locomotives built at the Baldwin Works.

The California & Northwestern is having two locomotives built at the Baldwin Works.

The Elgin, Joliet & Eastern has ordered four six-wheel switching engines (0-6-0) from the Baldwin Locomotive Works.

The Minneapolis, St. Paul & Sault Ste. Marie is having 14 locomotives built at the Schenectady Works of the American Locomotive Co.

F. M. Hicks, of the Hicks Locomotive & Car Works, has sold one freight locomotive to the Waterloo & Cedar Falls Rapid Transit, one six-wheel switching engine to the American Lumber Co.; one locomotive to the Florida & Alabama Land Co., and two narrow gage locomotives to Garvey Bros. & McGee, Memphis, Tenn.

CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 129 cars.

The Great Bear Spring Co. has ordered three tank cars from the American Car & Foundry Co.

The Evansville & Terre Haute has ordered three passenger cars from the Pullman Company.

The South & Western is reported in the market for 25 hopper cars, 10 box cars and 10 flat cars.

The St. Louis Southwestern has ordered 2,000 freight cars from the American Car & Foundry Co.

The Chicago & Eastern Illinois has ordered 100 ballast cars from the American Car & Foundry Co.

The Chieftain Coal & Coke Co., Wilsonburg, W. Va., is reported to be in the market for 400 gondolas.

F. M. Hicks, of the Hicks Locomotive & Car Works, has sold one private theatrical car to Ward & Wade.

The Fairmont & Clarksburg Traction has ordered one 10-bench car body from the American Car & Foundry Co.

The Fort Smith & Western has ordered one first-class, one second-class and one combination coach from the American Car & Foundry Co.

The Buffalo, Rochester & Pittsburgh has ordered three combination cars from the American Car & Foundry Co. for September, 1903, delivery.

The Chambersburg, Green Castle & Waynesboro has ordered four closed and three open motor car bodies from the American Car & Foundry Co.

The Evansville & Terre Haute, as reported in our issue of June 5, has ordered 100 coal cars of 80,000 lbs. capacity from the American Car & Foundry Co., for September, 1903, delivery. The special equipment includes American Steel Foundries bolsters, Damascus brake-beams, Miner draft rigging, National adjustable brasses and McCord journal boxes.

The Mississippi River & Bonne Terre, as reported in our issue of May 15, has ordered two passenger coaches, one combination coach and one private car from the American Car & Foundry Co. The passenger coaches and combination coach will be 51 ft. 6 in., and 52 ft. 6 in. long respectively. Special equipment includes Westinghouse brakes, Railway Steel-Spring Co.'s springs, American Car & Foundry Co.'s reversible high-back seats and steel platforms, Safety Car Heating & Lighting Co.'s heating system, with Baker heater and Globe ventilators. The private car will be 72 ft. long and 9 ft. 8 in. wide. The special equipment includes Westinghouse brakes, Diamond brake-beams and American Car & Foundry Co.'s steel platforms and trap doors.

The Pere Marquette, as reported in our issue of May 29, has ordered 10 cabooses from the American Car & Foundry Co. The cabooses will be 28 ft. long over end sills; 33 ft. 6 in. long over buffers; 8 ft. 6 in. wide, over side sills, and 15 ft. high to top of cupola; 11 ft. 7¾ in. high to top of running board. The special equipment includes: M. C. B. axles; Common Sense body bolsters; National hollow brake-beams; Congdon cast-iron brake-shoes; M. C. B. standard brasses made by the National-Fulton Brass Mfg. Co.; Tower couplers; Butler draft rigging; Harrison dust guards; Michigan Central heating system; Symington journal boxes and lids; Adams & Westlake lamps; Sherwin-Williams paint; Railway Steel-Spring Co.'s springs, and Pere Marquette swing motion four-wheel trucks.

BRIDGE BUILDING.

ALTOONA, PA.—Plans have been completed for the proposed Seventeenth street bridge over the Pennsylvania tracks.

ANDERSON, IND.—The County Commissioners will soon be ready to let the contract for a $35,000 bridge over White River at Delaware street.

ANN ARBOR, MICH.—The Common Council is considering the question of building a new bridge at Congress street, and moving the present bridge to Forest avenue.

ARLINGTON, WASH.—The bridge over the south fork of Stillaguamish river has been condemned and will have to be replaced.

BLOOMSBURG, PA.—The Pennsylvania R. R. bridge over Catawissa creek has been destroyed by fire.

BUFFALO, N. Y.—It is reported that the Grade Crossing Commission has completed plans for a subway at the West Shore and Buffalo Creek railroad crossings in Clinton street, and footbridges at the Fulton street and Elk street crossings of the Erie; Fulton street crossing of the Lake Shore, and the Prenatt street, Buffalo Creek and Perry street crossings of the Pennsylvania.

CHICAGO, ILL.—Bids will be received at the U. S. Engineer Office, 1637 Indiana avenue, until noon, June 27, for four riveted steel highway bridges. J. H. Willard, Maj. Engrs.

CHICKASHA, IND. T.—Two Rock Island bridges over Canadian and Washita rivers have been washed out.

COLUMBIA, S. C.—Several bridges were carried away by Congaree River in the flood of June 6.

COLUMBUS, OHIO.—Bids will be received June 25 for the Cleveland avenue bridge.

The Commissioners of Franklin County will build nine bridges and culverts. L. E. Jones, County Auditor.

DANVILLE, ILL.—A $20,000 bridge will be built over Vermillion river at College street.

DULUTH, MINN.—It is reported that the city will readvertise for bids for a bridge over the canal.

GRAND RAPIDS, MICH.—The Committee on Roads and Bridges of Kent County will receive bids until noon, June 27, for the substructure and superstructure of a 600-ft. steel bridge, with 20-ft. roadway, to be built over Grand River at North Park. P. C. Campbell, Chairman; L. W. Anderson, engineer.

ELMA, WASH.—A $6,700 steel bridge will be built over Humptulips river by the Puget Sound Bridge & Dredging Co.

HARRIMAN, TENN.—The Tennessee Central will build a steel bridge over Emory river.

HARTFORD, CONN.—The city will issue bonds for the $1,940,000 bridge over Connecticut River.

HAVRE DE GRACE, MD.—The Philadelphia, Baltimore & Wilmington is said to have completed plans for a 3,300-ft. bridge to take the place of the Susquehanna bridge.

HAVRE, MONT.—The County Commissioners will build a 200-ft. Howe truss bridge over Milk River at Bowes Ford.

INDIANAPOLIS, IND.—The County Commissioners will receive bids June 26 for bridges in Pipe and Wayne townships.

JEFFERSON, N. H.—Two railroad bridges in this vicinity have been destroyed by forest fires.

LANSING, MICH.—The city has been authorized to issue $20,000 bonds for the Washington avenue bridge.

LONDON, ONT.—The London City Council has been asked to join Westminster township in building a bridge over Thames river at Adelaide street. If the Councils fail to agree a private bridge may be built by the McClary Manufacturing Co.

MANKATO, MINN.—Edgar Weaver, County Auditor, will receive bids until noon, June 22, for a steel bridge in Ceresco Township.

MARSEILLES, ILL.—The city has voted $10,000 toward a $17,000 bridge at Main street.

MARSHFIELD, ORE.—A new bridge is proposed over South slough.

MARTINTON, ILL.—A bridge will be built over Iroquois river at Rivards Ferry.

MAUMEE, OHIO.—It is reported that a contract for a $280,000 bridge over Maumee river between this city and Perrysburg has been given to the American Bridge Co. by the Toledo, Urban & Interurban Ry.

NEWPORT, KY.—Bids will be received June 22 for a 190-ft. steel bridge to be built by the county. W. J. Hissem, County Judge.

NEW YORK, N. Y.—The Board of Estimate has appropriated $6,535,000 for steel work on the new Manhattan bridge No. 3.

The contract for the steel under-flooring of the Williamsburg bridge was given to the R. W. Hood Co. for $168,746.

NORTHFIELD, MASS.—The New London & Northern may build a new bridge.

NORTH HERO, VT.—The 1,700-ft. bridge connecting Grand Isle and North Hero in Lake Champlain will be repaired with stone. O. P. Knight, County Clerk.

NORTH TOWANDA, PA.—The court has been petitioned for a county bridge over Susquehanna river at Blackman's ferry.

OTTAWA, ONT.—The County Commissioners will receive bids July 1 for steel bridges 167 ft. and 232 ft. long over Blanchard River.

PAWNEE, OKLA. T.—C. R. Adams, County Clerk, will open bids June 13 for three steel truss bridges of 80-ft. spans, to be built over Black Bear creek.

PERKINS, OKLA. T.—A steel bridge will be built over Cimarron river.

PIEDMONT, W. VA.—The Commissioners of Mineral County, W. Va., and Allegheny County, Pa., have voted to build a $14,000 bridge over Potomac river.

PLAINFIELD, N. J.—Bids received for the Girard avenue bridge to be built by the freeholders of Union and Somerset Counties have been rejected and new bids will soon be asked.

ROCKFORD, ILL.—The City Council has been petitioned for a new bridge over Rock river.

SEATTLE, WASH.—The Seattle & San Francisco Ry. & Navigation Co. has filed plans with the U. S. Engineers for a steel bridge, with draw, to cross the east waterway, Seattle harbor.

SKOWHEGAN, ME.—The town is again considering the question of a steel bridge over North Channel.

SPARTANBURG, S. C.—High water in the Pacolet valley June 6 destroyed a number of bridges in this vicinity.

SYRACUSE, N. Y.—The Spring street bridge over Alvord creek has been destroyed by fire.

TERRE HAUTE, IND.—It is reported that the Cleveland, Cincinnati, Chicago & St. Louis may build a new bridge over Wabash River.

TULSA, IND. T.—The Tulsa Commercial Bridge Co. is said to have been formed to build a steel bridge over Arkansas River.

WABASH, IND.—The County Commissioners will receive bids June 17 for eight concrete arch bridges.

WAUPACA, WIS.—The Board of Public Works will receive bids for a bridge on Berlin street.

Other Structures.

BALTIMORE, MD.—The Western Maryland R. R. will build several freight and coal piers along the shore at Spring Gardens.

BEAVER FALLS, PA.—It is said that plans have been drawn by Walter Kennedy, of Pittsburg, for two blast furnaces, open hearth steel works and sheet and tin plate mills to be built near this place.

BLENHEIM, ONT.—Plans have been made for a large steel coal chute to be built by the Lake Erie & Detroit River R. R.

IRWIN, PA.—The Eleanor Iron & Steel Company, makers of iron bars and skelp, may add an open hearth steel plant to its works.

LEWISTON, IDAHO.—Plans are being made for a new $30,000 freight depot.

PEORIA, ILL.—The Peoria Car Building Co., recently incorporated with $1,000,000 capital, is preparing to build shops.

SPOKANE, WASH.—It is reported that the Great Northern will enlarge the Hillyard shops.

WASHINGTON, D. C.—The contract has been signed by the Commissioners of the District of Columbia and by the Treasury Department with Cope & Stewardson, of Philadelphia, as architects for the new municipal building for Washington. Plans will be prepared at once. Of the $2,000,000 appropriated by Congress for this building, $550,000 was paid for the site and $1,450,000 is available for the building.

WHEELING, W. VA.—The Davis Car Wheel Co. may build a factory in this city.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BELLINGHAM BAY & BRITISH COLUMBIA.—Bids are being asked by J. J. Donovan, Chief Engineer, Whatcom, Wash., for building an extension of this line from Hampton Siding west to Lynden, five miles. (May 22, p. 367.)

BUTTE COUNTY.—An officer writes that the proposed route of this road is from Chico, Cal., to Paradise, and thence north to Sterling, 32 miles. Contract for grading the entire route has been let to E. B. & A. L. Strong, Oakland, Cal. The character of the work is heavy, with a maximum grade of 179 ft. per mile, and a maximum curvature of 12 deg. There will be one tunnel 670 ft. long. J. B. Robinson, Chico, Cal., is Chief Engineer; F. M. Clough, General Manager. (May 8, p. 335.)

Calgary & Edmonton.—Application has been made to Parliament for permission to build branches from Lacombe eastward 75 miles; from Weteskiwan in an easterly direction, and from Edmonton to Fort Assiniboia. (See Construction Supplement.)

California Roads (Electric).—Alfred D. Gower and Francis Cutting, of San Francisco, and F. A. Brush, of Santa Rosa, have recently filed articles of incorporation for a new company to build electric railroads in California. It is proposed to build from Santa Rosa southwest to Sebastopol, and south to Petaluma, 12 miles, paralleling the California Northwestern. Rights of way are now being secured and surveying parties are in the field.

Canadian Northern.—The bill which was recently passed by the Canadian Parliament, guaranteeing the bonds of this road to the extent of $13,000 per mile, provides for the building of 620 miles of line from Grand View, Man., to Edmonton, and for 100 miles from Erwood to Prince Albert.

Cedar Rapids & Iowa City Ry. & Light.—This company has been organized in Cedar Rapids, with a capital stock of $2,000,000. The object of the company is to build a line from Cedar Rapids to Iowa City, 28 miles. The company succeeds the Cedar Rapids, Iowa City & Southern, incorporated in December, 1901. The latter company completed surveys from Cedar Rapids to Iowa City and south from there to the Mississippi River, and also north from Cedar Rapids to Independence, Iowa. The officers of the new company are Stephen J. Dows, President; J. K. Smith, Vice-President, and E. E. Pinney, Secretary.

Central of Arkansas.—It is reported that this company, which was recently incorporated in Arkansas, is ready to let contracts for the first 50 miles of its line south from Dardanelle, Ark. It is proposed to extend the line eventually to Hot Springs, making it 90 miles long. F. M. Molitor, Fort Smith, Ark., is President. (April 10, p. 274.)

Central of Georgia.—An amendment to the charter of this company has been passed, granting permission to build a branch line from Missouri Ridge, Ga., through McFarland's Gap to Cloud Springs, three miles. H. M. Steele, Savannah, Ga., is Chief Engineer.

Chicago, Burlington & Quincy.—Contract is reported let to the Stubbs-Johnson Construction Co. for grading the extension from Mexico, Mo., to Old Monroe, 63 miles. The character of the work is light, with a maximum grade of 5 per cent., and a maximum curvature of 1 deg. A. W. Newman may be addressed at Mexico, Mo. (May 22, p. 368.)

Chicago, Rock Island & Pacific.—Rights of way are reported secured for an extension of the Lawton-Waurika branch of this road from Waurika, via Cornish, to Ardmore, Ind. T., 52 miles. Grading will be begun at once.

Christopher & Herrin.—A charter has been granted this company in Illinois to build from a point on the Illinois Central near Christopher south to Herrin in Williamson County, 10 miles. S. F. Andrews, A. P. Humburg, P. L. Delay and others, of Chicago, are incorporators.

Cuban Roads.—Capitalists of Cienfuegos have under consideration the construction of a railroad to Cuatro Caminos, in the Province of Matanzas, 41 miles. The road would shorten the time between Cienfuegos and Habana, and would open up a rich agricultural region.

De Kalb & Southwestern Electric.—Incorporation has been granted this company in Illinois, to build from De Kalb southwest to Steward, 15 miles, with a branch line east to Chicago. E. L. Titus, Steward, Ill.; S. D. Frost, Amboy, Ill.; G. T. Shaw, Dixon, Ill., and others are incorporators.

Denver, Enid & Gulf.—The first section of this road between Guthrie, Okla. T., and Enid, 57 miles, was opened for traffic on June 1. E. L. Peckham, Enid, Okla. T., is General Manager. (See Construction Supplement.)

Detroit & Mackinac.—Maps have been filed by this company with the Board of Railroad Crossings showing a proposed extension of its main Cheboygan line to a point in the vicinity of Mullet Lake, and an extension from Rose City.

Easton & Washington Traction.—This company has filed maps with the Secretary of State showing its proposed new route from Phillipsburg, N. J., east to Washington, 15 miles. The new line, when completed, will parallel the Delaware, Lackawanna & Western between these two points.

Galesburg, Monmouth & Rock Island.—Articles of incorporation have been filed by this company in Illinois to build from Galesburg north to Rock Island, 40 miles. W. B. McKinley, J. E. Johnson and Charles Zilly, Champaign, Ill., are incorporators.

Hayneville.—Articles of incorporation have been filed by this company to build from Hayneville, Ala., east to Morganville, 10 miles. W. P. Russell, C. W. Garrett, J. M. Salley, H. S. Houghton and others, of Hayneville, are incorporators.

Lackawanna & Wyoming Valley (Electric).—Work is in progress on part of this electric line from Wilkesbarre, Pa., to Carbondale. The road has been completed between Pittston and Scranton. It will parallel the Delaware, Lackawanna & Western, the Lehigh Valley, and the Central of New Jersey for part of the distance. The company expects to do miscellaneous freight and passenger business. (See Construction Supplement.)

Lawton & Chickasaw Central.—A charter has been granted to this company to build from Lawton, Ind. T., to Sulphur Springs, 85 miles. J. W. Martin, J. H. Wolverton, H. W. Hanna and others, of Lawton, are incorporators.

Mexican Roads.—The Mexican Government has granted a concession to Guillermo Purcell, of Saltillo, Mexico, to build and operate a railroad from a point on the Coahuila & Zacatecas to the mining town of San Pedro Ocampo, in the State of Zacatecas. The principal office of the company will be situated at Saltillo.

It is reported that the Nogales Copper Co. will build a railroad from Magdalena, in the State of Sonora, Mexico, to its mines, about 40 miles distant. The proposed line will connect with the Sonora line of the Southern Pacific at Magdalena.

Press reports state that the Mexican Mining & Exploration Co. will build a railroad from a point on the Mexican Central to its mines situated about 60 miles from Parral, Mexico. J. V. Dignowity, of San Antonio, Texas, is General Manager.

A concession has been granted to Andrew Mackenzie, by the Mexican Government, for building and operating a railroad from Los Xuchiles, in the State of Vera Cruz, to San Juan de la Punta, with a branch from Tierra Blanca to Vera Cruz. Three miles of the road are to be built within 18 months and the balance the succeeding year. The motive power will probably be steam. Los Xuchiles is about 15 miles due west from San Juan de la Punta. The principal office of the company will be at Mexico City.

The Yaqui Copper Co. is reported to be about to build a railroad from a point on the Southern Pacific, in the State of Sonora, Mexico, through Ures to Campo Santo Nino.

Michigan Central Traction.—Press reports state that work will be begun immediately on this new line, which is to run from Lansing, Mich., to Grand Lodge, Charlotte, Bellevue and Battle Creek, 75 miles. A contract for 25 miles is reported let to Burwell & Co., New Haven, Conn. Bids will shortly be asked for grading the remainder of the line. R. Rosenstrok, Cleveland, Ohio, is President, and A. J. White, Battle Creek, Mich., is General Manager. (See Construction Supplement.)

Muskogee Southern.—An officer writes that the proposed route of this road is from a point in Indian Territory, on the Kansas State line, south through Indian Territory to Shreveport, La. The line has been surveyed from Red Fork southeast to Spiro, Ind. T., 136 miles, and is now under survey north from Red Fork and south from Spiro. Contract for grading was recently let to the Kenefick Construction Co., Kansas City, Mo. D. W. Bolick, Muskogee, Ind. T., is Chief Engineer. (April 17, p. 290.)

Nacozari R. R.—An officer writes that work is now in progress between Cos, in the State of Sonora, Mexico, and Nacozari, 20 miles. Orman & Crook, Douglas, Ariz., are the contractors, and J. T. Logan is the superintendent in charge of the work at Douglas. (May 8, p. 336.)

Nashville, Chattanooga & St. Louis.—Contract has been awarded to the Southern Contracting Co., of Ludlow, Ky., for reducing the grade at Mile-post 29 west of Nashville. About 80,000 cu. yds. of earth and 20,000 cu. yds. of stone will have to be removed. The contract calls for completion of the work by Dec. 1.

National R. R. of Mexico.—It is stated that the recent acquisition of an interest in the National of Mexico by the Mexican Government, and the concession to that road of the exclusive right to occupy 400 miles of land along the Rio Grande River, will be likely to postpone or prevent the proposed extension of the Mexican Central between San Pedro, Mexico, and San Antonio.

Ocean Electric.—This company has applied to the Board of Estimate of New York City for a franchise to build an electric line between Rockaway and Far Rockaway, 6½ miles. There is only one highway between these places and the company intends to lay its tracks along this thoroughfare. The Board has postponed consideration of the matter pending the investigation of the law which prevents the laying of railroad tracks on macadamized roads in the Borough of Queens.

Ohio Valley Electric.—Articles of incorporation have been filed by this company in Indiana to build an electric line from Jeffersonville, via Charlestown and New Washington, Ind., to Madison, with a branch from Jeffersonville to Henryville, via Sellersburg and Memphis. Louis Schneck, of Seymour, Ind.; Geo. H. Voight, Jeffersonville, and others are interested.

Owensboro, Rockport & Vincennes.—Contract is reported let for grading this line from Vincennes, Ind., southeast to Jasper, via Petersburg, 40 miles. Rights of way have been secured, and surveys finished. H. S. Kennedy, Rockport, Ind., is interested.

Raleigh & Eastern North Carolina.—An officer writes that the proposed route of this road is from Raleigh, Wake County, N. C., in an easterly direction, via Wilson and Greenville, to Washington and eventually to tidewater, on Pamlico Sound, 100 miles. Branch lines will also be built from Wilson to Kinston, 35 miles, and from Raleigh to Durham, 26 miles. J. J. Thomas and J. M. Turner, of Raleigh, N. C., are incorporators. (March 13, p. 204.)

Ronceverte, Lewisburg & Western (Chesapeake & Ohio).—It is reported that this road will shortly be built by the Chesapeake & Ohio. It is to run from Ronceverte northwest to Rupert, a point on the Meadow River, and eventually to Gauley, W. Va., 45 miles. The new line will be operated by the Chesapeake & Ohio. It will furnish an outlet for certain coal mines.

St. Andrews, Quincy & Northern.—This company has been incorporated in Florida, names of incorporators not given. The Florida Legislature has passed a bill, granting 5,000 acres of land for every mile of road built. The proposed line will pass through the western portion of Florida, which is at present without railroad facilities. The terminus of the road will probably be at Quincy, Gadsden County.

St. Louis & San Francisco.—An officer of this road denies that the company is planning to build an extension from Vernon, Texas, southwest to Stamford, 90 miles.

St. Louis, Brownsville & Mexico.—A charter has been filed by this company in Texas. It is proposed to build from Sinton, Texas, south to Brownsville, with a branch line up the Rio Grande about 200 miles. This is supposed to be a Rock Island-Frisco project.

San Juan-Ponce (Porto Rico).—A bond for $100,000 has been deposited with the Guarantee Trust Co., of Scranton, Pa., by the Vandergrift Construction Co., of Philadelphia, to guarantee the building of a new electric railroad between San Juan and Ponce, 80 miles. Surveys are now in progress and grading will shortly be begun. (May 22, p. 368.)

San Pedro, Los Angeles & Salt Lake.—The following statement by President W. A. Clark concerning the progress of the work on this road, has been published in various newspapers: "I met President Ripley, of the Santa Fe, at Ash Fork, Ariz., and made an arrangement whereby the San Pedro road will have a trackage right over the Santa Fe tracks between San Bernardino and Daggett (90 miles), until such time as we see fit to build through the Cajon pass. This will be only a temporary arrangement, for the San Pedro line will eventually have its own rails all the way from Salt Lake City to San Pedro. This arrangement simplifies matters so that we shall have our road in operation within two years. We shall have our tracks finished between San Pedro, Los Angeles and Riverside by the middle of July, and we shall then begin closing the gap between Daggett and Calientes, the present southern terminus of the road which I have bought from the Oregon Short Line. We will build this piece of track from both ends, and it will be hurried along with reasonable despatch. We are putting down heavy steel, and all of our bridges will be of concrete, which will last forever. The San Pedro, Los Angeles and Salt Lake will be an entirely independent line. I have purchased the entire Oregon Short Line system south of Salt Lake City. It is an absolute purchase, and Mr. Harriman retains absolutely no interest in the property."

Southern.—President Samuel Spencer states that the plans of this company contemplate a second track through from Washington, D. C., to Atlanta, Ga., and that this and other betterments to be made will cost $25,000,000. It will take several years to complete the work. The Washington Division will be the first section of the road to have a double track. Extensive improvements will be made in the shops and yards at Alexandria, Va.

A contract has been let to T. B. Jones & Co. for grading the Danville extension of the Southern from Harrodsburg, Ky., to Danville, nine miles. Work will be begun as soon as the rights of way have been secured. (See Construction Supplement.)

Springfield & Jacksonville Rapid Transit.—Articles of incorporation have been filed by this company to build an electric line from Springfield, Ill., west to Jacksonville, 30 miles. E. C. Greenleaf, Jacksonville; R. B. Betleman, East St. Louis, and L. H. Coleman, Springfield, are incorporators.

Thunder Mountain.—A contract is reported let to the Northwestern Bridge & Construction Co., of Boise, Idaho, for building this new line. The road is to be 70 miles long, beginning at Van Wyck, Idaho, and the contract calls for its completion by Sept. 15. The State appropriated $20,000, with the provision that an equal amount be subscribed by private persons. This amount has already been given by companies owning mines in this vicinity.

Toledo & Ann Arbor (Electric).—Press reports state that rights of way have been secured by this company, and that work will shortly be begun. The proposed route is about 55 miles long, terminating at Ann Arbor, Mich., and paralleling the Ann Arbor R. R. for the greater part of the distance. J. N. Griffith, Wyandotte, Mich.; J. C. Bonner, Toledo, and others are interested.

Toledo & Indiana (Electric).—The proposed route of this road is from Toledo, Ohio, westward to Bryan, 55 miles, passing through the towns of Holland, Delta, Wauseon, Archibald and Stryker, and paralleling the Lake Shore & Michigan Southern. Grading is now in progress between Toledo and Wauseon. Riggs & Sherman, Toledo, Ohio, are the engineers in charge of the work.

Tombigbee R. R.—Articles of incorporation have been filed by this company in Alabama. It is proposed to build from Linden, Ala., to Aberdeen, Miss., through Merengo, Sumter and Pickens Counties in Alabama, and Monroe County, Miss. Connection will be made with the Louisville & Nashville at Linden. R. R. Zell, Birmingham, Ala., is one of the incorporators. (May 22, p. 368.)

White River & Mountain Home.—Articles of incorporation have been filed by this company in Arkansas to build a line from Cotter to Mountain Home, 12 miles. The company is capitalized at $150,000, and the incorporators include Geo. W. Keene, W. H. Brown, P. E. Bratton, of Mountain Home, Ark., and others.

Yazoo & Mississippi Valley (Illinois Central).—A sub-contract is reported let to Lewis & Jennings, Memphis, Tenn., for grading 11 miles of the 50-mile extension of this road from Yarbro, Miss., southwest to Swan Lake. McArthur Bros., Chicago, have the contract for the remainder of the work. (May 22, p. 368.)

GENERAL RAILROAD NEWS.

Berlin Branch.—This company, with its locomotives, cars and other property, and its franchises, was sold at foreclosure sale on June 2 to the York Trust Co., of York, Pa. The road is about four miles long and extends from East Berlin to a connection with the Western Maryland at Berlin Junction, Pa. The road will be improved and new rolling stock will be added. (May 22, p. 368.)

Canada Southern.—At a recent meeting of the stockholders of this company, it was voted to re-lease the road to the Michigan Central for a period of 999 years, on the following terms: A guarantee of dividends on the stock at the rate of 2½ per cent. per annum until Jan. 1, 1910, and thereafter at 3 per cent. It was also voted to issue bonds to retire the existing $14,000,000 first mortgage, and $6,000,000 second mortgage bonds maturing in 1908 and 1918 respectively. (May 1, p. 320.)

Chicago, Cincinnati & Louisville.—This is the name of the new company formed by the consolidation of the Cincinnati, Richmond & Muncie with the Cincinnati & Indiana Western. There will be no change in officers.

Cincinnati, Richmond & Muncie.—See Chicago, Cincinnati & Louisville.

Hudson & Manhattan.—See Pennsylvania below.

Michigan Central.—See Canada Southern above.

National R. R. of Mexico.—The Mexican Government has issued the following official explanation of its purchase of an interest in the National: The Government has arranged with bankers of New York for the purchase of 253,655 shares of the National Railway Company of Mexico, a fact which, taken in connection with the mode of organization of the company will give the government control over the line, while at the same time it will continue to exercise control over the Interoceanic, or, in other words, over a system of railroads extending from the Gulf of Mexico to the northern frontier of the Republic.

Pennsylvania.—President A. J. Cassatt has stated that his company is in no way connected with the new tunnel which is to be built by the Hudson & Manhattan Co., between Jersey City and the lower part of Manhattan (Cortlandt street). No Pennsylvania trains will be run through the tunnel, but when it is completed the road may make a traffic contract with the tunnel company, passengers from the Pennsylvania trains changing to the tunnel electric cars at Jersey City.

Public Service Corporation.—A mortgage for $20,200,000 has been filed by this New Jersey company with the Fidelity Trust Co. of New York. The mortgage covers all the stock of the United Electric and other electric companies which recently came under the control of the Public Service Corporation, and is given to guarantee the payment of securities issued in exchange for the stocks.

San Antonio & Aransas Pass.—The Texas State Railroad Commission has ordered this company to cancel $1,700,000 of bonds which are alleged to have been issued illegally, and also to reduce its capital stock from $5,000,000 to $1,000,000. The road must also be segregated entirely from the Southern Pacific, which now holds 49,270 of the 50,000 shares of the stock. The officers have notified the commission that the order will be obeyed.

Washington Southern.—An amendment to the charter of this company has been passed increasing the capital stock from $2,500,000 to $4,000,000. The money will be used for necessary improvements on the road.